JBL SYNTHESIS®

SYNTHESIS
SDEC-1000/2500
INSTALLATION GUIDE

JBL SYNTHESIS®

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JBL Synthesis SDEC-1000/2500
Installation Guide

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Design and digital production by Harman Digital Systems Group
Design and Production Center, Woodbury, New York

JBL

JBL Consumer Products
250 Crossways Park Drive, Woodbury, NY 11797
8500 Balboa Boulevard, Northridge, CA 91329
800-336-4JBL

A Harman International Company

Printed on Recycled Paper
Part Number: 1113-SDECInstal

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1.1 Important Safeguards For Audio Products

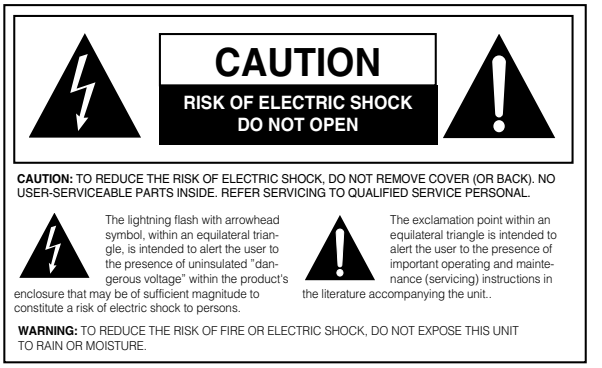
PLEASE READ CAREFULLY ALL THE FOLLOWING IMPORTANT SAFEGUARDS THAT ARE APPLICABLE TO YOUR EQUIPMENT

1. ***Read Instructions –*** *All the safety and operating instructions should be read before the product is operated.*
2. ***Retain Instructions –*** *The safety and operating instructions should be retained for future reference.*
3. ***Heed Warnings –*** *All warnings on the product and in the operating instructions should be adhered to.*
4. ***Follow Instructions –*** *All operating and use instructions should be followed.*
5. ***Water and Moisture –*** *The product should not be used near water – for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, and the like.*
6. ***Carts and Stands –*** *The product should be used only if a cart or stand is recommended by the manufacturer.*

6a. *A product and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product and cart combination to overturn.*

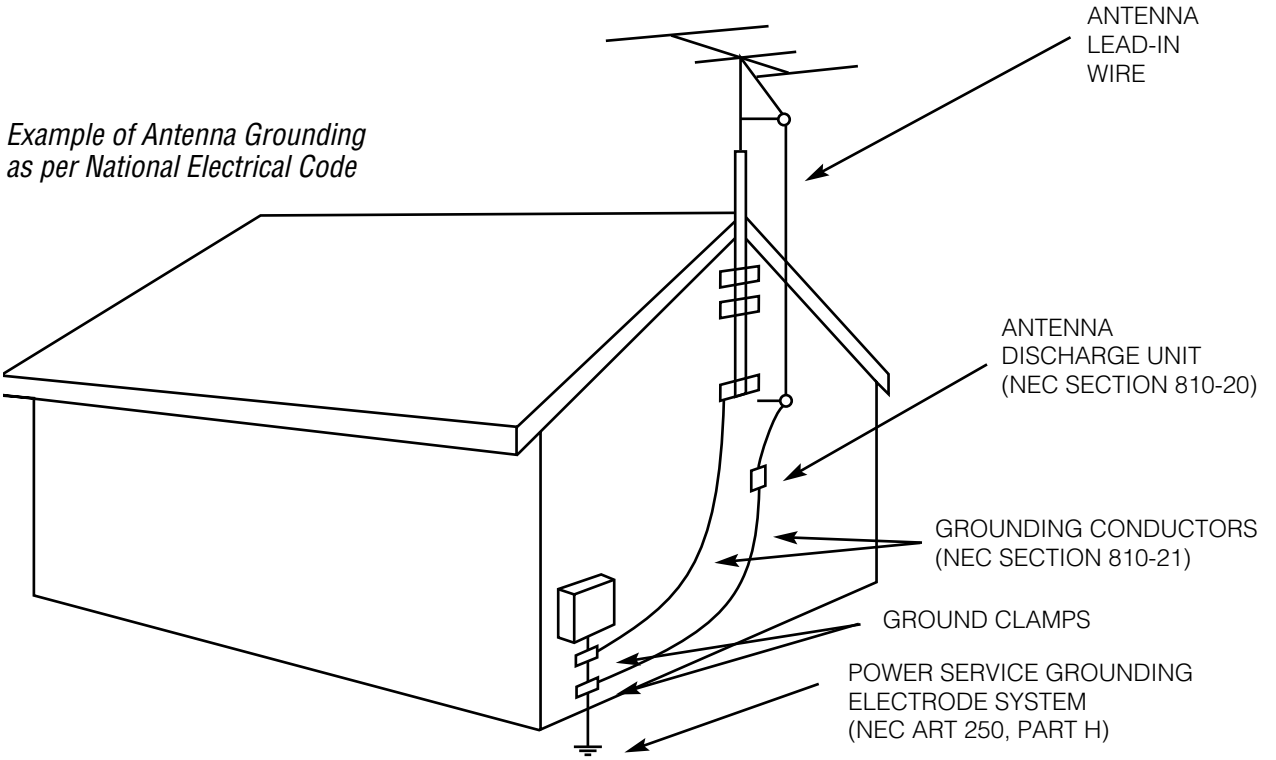
7. ***Wall or Ceiling Mounting –*** *The product should be mounted on a wall or ceiling only when and as recommended by the manufacturer.*
8. ***Ventilation –*** *The product should be situated so that its location or position does not interfere with its proper ventilation. For example, the product should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or placed in a built-in installation, such as a bookcase or cabinet, that may impede the flow of air through the ventilation openings.*
9. ***Heat –*** *The product should be situated away from heat sources such as radiators, heat registers, stoves, or other products that produce heat. If placed near an amplifier, check with the manufacturer for applicability.*
10. ***Power Sources –*** *The product should be connected to a power supply only of the type described in the operating instructions or as marked on the product.*
11. ***Grounding or Polarization –*** *Precautions should be taken so that the grounding or polarization means of a product is not defeated.*
12. ***Power-Cord Protection –*** *Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the product.*
13. ***Cleaning –*** *The product should be cleaned only as recommended by the manufacturer.*
14. ***Power Lines –*** *An outdoor antenna should be located away from power lines.*

CAUTION: TO PREVENT ELECTRIC SHOCK, DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.
ATTENTION: POUR PREVENIR LES CHOCS ELECTRIQUES NE PAS UTILISER AVEC UN PROLONGATEUR. UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.


CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONAL.
The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.
The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the unit..
WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

1.1
IMPORTANT SAFEGUARDS

Example of Antenna Grounding as per National Electrical Code



15. ***Nonuse Periods –*** *The power cord of the product should be unplugged from the outlet when left unused for a long period of time.*

16. ***Object and Liquid Entry –*** *Care should be taken so that the objects do not fall and liquids are not spilled into the enclosure through the openings.*

17. ***Outdoor Antenna Grounding –*** *If an outside antenna is connected to the receiver, be sure the antenna system is grounded so as to provide some protection against voltage surges and built-up static charges. Article 810 of the National Electrical Code, ANSI/NFPA 70, provides information with regard to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna-discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode (see above figure).*

18. ***Damage Requiring Service –*** *The product should be serviced by qualified service personnel when:*

    a. *The power supply or the plug has been damaged; or*

    b. *Objects have fallen on, or liquid has been spilled into, the product; or*

    c. *The product has been exposed to rain; or*

    d. *The product does not appear to operate normally or exhibits a marked change in performance; or*

    e. *The product has been dropped, or the enclosure damaged.*

19. ***Servicing –*** *The user should not attempt to service the product beyond what is described in the operating instructions. All other servicing should be referred to qualified service personnel.*

Note To CATV System Installer:

This reminder is provided to call the CATV system installer's attention to Article 820-22 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

Deutsch
Wichtige Sicherheitsanweisungen

Heben Sie sich diese Sicherheitsanweisungen auch für später auf.

Befolgen Sie alle auf der Vorrichtung stehenden Anweisungen und Warnungen.

Immer nur mit der richtigen Spannung verwenden! Die Gebrauchsanweisungen des Herstellers informieren Sie über die elektrischen Anforderungen. Vergessen Sie nicht daß bei vershiedenen Betrievsspannungen ggf. auch verschiedene Leitungskabel und/oder Verbindungsstacker zu verwenden sind.

Stellen Sie die Vorrightung nicht in ein unbelüftetes Getell oder unmittelbar über wärmeerzeugende Geräte wie z.B. Tonverstärker. Halten Sie die in den Produktspezifikationen angegebene maximale Umgebungstemperatur bei Betrieb ein.

Schlitze und Öffnungen im GehUause dienen der Belüfung; um verläßlichen Betrieb sicherzustellen und Überheizen zu vermeiden dürfen diese Öffnungen nich verstopft oder abgedeckt werden. Stecken Sie nie irgend einen Gegenstand durch die Belüftungsschlitze. Vergießen Sie keine Flüssigkeiten auf den Apparat.

Dieses Produkt is mit einem 3-drahtigen Erdungsstecher ausgerüstet. Diese Sicherheitsmaßnahme darf nicht unwirksam gemacht werden.

Schließen Sie nie Tonverstärker unmittelbar an einen Anschluß des Apparates an.

Um elektrischen Schlag oder Feuer zu vermeiden, setaen Sie den Apparat weder Regen noch Feuchtigkeit aus und betreiben Sie ihn nicht dort wo Wasser eindringen könnte.

Versuchen Sie nicht den Apparat zu betreiben falls er fallen gelassen, beschädigt, oder Flüssigkeiten ausgesetzt wurde, oder falls sich seine Arbeitsweise derart ändert daß daraus ein Bedarf nach Raparatur zu schließen ist.

Dieser Apparat sollte nur von qualifizierten Fachleuten geöffnet werden. Das Abnehmen von Abdeckungen setzt Sie gefährlichen Spannungen aus.

Dieses Dreick auf ihrem Apparat warnt Sie voe nicht-isolierter, gefährlicher Spannung im Gehäuse…stark genug um eine Berührungsgefahr darzustellen.

Diese Dreick auf ihram Apparat bedeutet daß wichtige Betriebs- und Wartungsanweisungen in der mitgelieferten Dokumentation zu finden sind.

Español
Instrucciones importantes de sequiridad

Guarde esta instrucciones para uso posterior.

Utilice siempre el voltaje correcto. Diríjase a las instrucciones de operación del fabricante para obtener las especificaciones de potencia. Esté al tanto de que voltajes de operación distintos requieren el uso de cable y/o enchufes distintos.

No instale esta unidad en un estante sin vntilación, ni tampoco directamente encima de equipose que generen calor tales como amplificadores de potencia. Fíjese en las temperaturas ambientales máximas de operación que se mencionan en las especificaciones del producto.

Las aperturas y ranuras del chasis sirven para proveer la ventilación necesaria para operar la unidad con sequridad y para prevenir sobrecalentamiento, y por lo tanto no pueden ser obstruidas o cubiertas. No introcuzca objetos de ningún tip a través de las ranuras de ventilación, y nunca deje caer ningún líquido sobre la unidad.

Este producto está equipado con un enchufe de 3 clavijas con conexión a ierra. Este es un elemento de seguridad que no debe ser eliminado.

Nunca conecte ningùn tipo de salida de amplificadores de sonido directamente a los conectores de la unidad.

Para prevenir descargas eléctricas o incendios, mantenga la unidad alejada de la lluvia, humedad o cualquier lugar en el que pueda entrar en contacto con ague.

No trate de hacer funcionar la unidad si se ha caído, está dañada, ha entrado en contacto con lítuidos, o si nota cualquir cambio brusco en su funcionamiento que indique la necesidad de hacerle un servicio de mantenimiento.

Esta unidad deberá ser abierta únicamente por personal calificado. Si usted quita las coberturas se expondrá a voltajes peligrosos.

Este triángulo que apaece en su componente le advierte sobre la existencia dentro del chasis de voltajes peligrosos sin aislantes…voltajes que son lo suficientemente grandes como para causar electrocución.

Este triángulo que aparece en su componente lo alerta sobre las instrucciones de operación y mantenimiento importantes que están en los materiales de lectura que se incluyen.

Français
Instructions de Sûreté Importantes

Gardex ces instructions pour réference future.

Observez toutes les instructions et tous les avertissements marqués sur l'appareil.

Branchez uniguements sur un réseau de tension indiquée. Consultez le manuel d'instruction du fabriquant pour les spécifications de courant. N'oubliez pas que différentes tensions peuvent nécessiter l'utilisation de cables et/ou de fiches deconnexion différents.

N'installez pas l'appareil en un compartiment non-aéré ou directement au-dessus d'équipements générateurs de chaleur, tels qu'amplificateurs de courants, etc. Ne dépassez pas la température ambiante maximale de fonctionnement indiquée dans les spécifications du produit.

Des fentes et ouvertures sont prévues dans le boîtier pour l'aération; Pour assurer le bon fonctionnement et pour prévenir l'échauffement, ces ouvertures ne doivent pas être couvertes ou bloquées. N'insérez pas d'objets dans les fentes d'aération. Empêchez tout liquide de se répandre sur l'appareil.

Ce produit est muni d'une fiche à trois fils pour la mise à terreee. Ceci est une mesure de sécurité et ne doit pas être contrariée.

Ne connectez jamais d'amplificateurs audio directement aux connecteurs de l'appareil.

Pour empêcher les chocs électriques et le danger d'incendie, évitez d'exposer l'appareil à la pluie ou à l'humidité, et ne le mettez pas en marche en un endroit où il serait exposé aux éclaboussures d'eau.

N'essayez pas de faire fonctionner l'appareil s'il est tombé à terre, a été endommangé, exposé à un liquide, ou si vous observez des différences nettes dans son fonctionnement, indiquant la nécessité de réparations.

Cet appareil ne doit être ouvert que par un personnel de service qualifié. En enlevant les couvercles vous vous exposez àdes tensions électriques dangereuses.

Ce triangle, sur votre appaeil vous avertit de la présence de tension dangereuse, non-isolée à l'intérieur du boîtier…une tension suffisante pour représenter un danger d'electrocution.

Ce triangle sur sur votre appareil vous invite de suivre d'importantes instructions d'utillisation et d'entretien dans la documentation livrée avec le produit.

Italiano
Importanti norme di sicurezza

Conservare le presenti norme per l'utilizzo futuro.

Osservare tutte le istruzioni e le avvertenze apposte sull'unita.

Utilizzare esclusivamente con la tensione di rete corretta. Consultare le istruzioni operative fornite dal fabbricante per i dati riguardanti la tensione e l'assorbimento di corrente. Potrebbe essere necessario l'uso di cavi di rete e/o di spine diverse a seconda della tensione utilizzata.

Non installare l'unità in uno scaffale privo di ventilazione oppure direttamente sopra una fonte di calore, come, ad esempio, un amplificatore. Non superare la temperatura ambientale massima di funzionamento riportata nei dati tecnici del prodotto.

Le fessure e le altre aperture nella scatola servono alla ventilazione. Per un funzionamento affidabile, e per evitare un eventuale surriscaldamento, queste aperture non vanno ostruite o coperte in nessun modo. Evitare in tutti i casi di inserire oggetti di qualsiasi genere attraverso le fessure di ventilazione. Non versare mai del liquido di nessun tipo sull'unità.

Questo pordotto viene fornito con una spina a 3 fili con massa. Tale dispositivo di sicurezza non va leiminato.

Evitare sempre di collegare le uscite dell'amplificatore auio direttamente ai connettori dell'unità.

Per prevenire il pericolo di folgorazione e di incendio non esporre l'unità alla pioggia o ad un'umidtà eccessiva; evitare di adoperare l'unità dove potrebbe entrare in contatto con acqua.

Evitare di adoperare l'unità se la stessa è stata urtata violentemente, se ha subito un danno, se è stata esposta ad un liquido o in caso di un evidente cambiamento dell prestazioni che indichi la necessità di un intervento di assistenza tecnica.

Ogni intervnto sull'unità va esqguito esclusivamente da personale qualificato. La rimozione della copertura comporta l'esposizione al pericolo di folgorazione.

Il present triangolo impresso sul componente avverte della presenza di tensioni pericolose non isolate all'interno della copertura…tali tensioni rappresentano un pericolo di folgorazione

Il presente triangolo imprsso sul componente avverte l'utente della presenza nella documentazione allegata di importanti istruzioni relative al funzionament ed alla manutenzione.

Dansk
Vigtig information om sikkerhed

Gem denne vejledning til senere brug.

Følg all anvisninger og advaresler på apparatet.

Apparatet skal altid tilslttes den korrekte spænding. Der henvises til brugsanvisningen, der indeholder specifikationer for strømforsyning. Der gøres opmærksom på, at ved varierende driftsspændinger kan det blive nødvendigt at bruge andre lednings- og/eller stiktyper.

Apparated må ikke monteres i et kabinet uden ventilation eller lige over andet udstyr, der udvikler varme, f.eks. forstærkere. Den maksimale omgivelsestemperatur ved drift, der står opført i specifikationerne, skal overholdes.

Der er ventilationsåbninger i kainettet. For at sikre apparatets drift og hindre overophidning må disse åbninger ikke blokeres elle tildækkes. Stik aldrig noget ind igennem ventilationsåbningerne, og pas på aldrig at spilde nogen form for væske på apparatet.

Dette apparat er forsynet med et stik med jordforbindelse. Denne sikkerhedsforanstaltning må aldrig omgås.

Udgangsstik fra audioforstærkere må aldrig sættes direkte i apparartet.

Apparatet må ikke udsættes for regn eller fugt og må ikke bruges i nærheden af vand for at undgå risiko for elektrisk stød og brand.

Apparatet må aldrig bruges, hvis det er blevet stødt, beskadiget eller vadt, eller hvis ændringer i ydelsen typer på, at det trænger til eftersyn.

Fette apparat må kun åbnes af fagfolk, Hvis dækslet tages af, udsættes man for livsfarlig højspænding.

Denne mærkat på komponenten advarer om uisoleret, farlig spænding i apparatet… høj nok til at give elektrisk stød.

Denne mærkat på komponenten advarer om vigtig driftsog vedligeholdsinformation i den tilhørende litteratur.

Suomi
Tärkeitä varten

Säilytä nämä ohjeet tulevaa käyttöä varten.

Seuraa kaikkia yksikköön merkittyjä ohjeita ja varoituksia.

Käytä aina oikeaa verkkojännitettä. Tehovaatimukset selviävät valmistajan käyttöohjeista. Huomaa, että eri käyttöjännitteet saattavat vaatia toisenlaisen verkkojohdon ja/tai- pistokkeen käytön.

Älä asenna yksikköä telineeseen jossa ei ole tuulet usta, tai välittömästi lämpöä tuottavien laitteiden, esim. tehovahvistimien, yläpuolelle. Ympäristön lämpötila käytössä ei saa ylittää twotespesifikaation maksimilämpötilaa.

Kotelo on varustettu tuuletusreiillä ja -aukiooa. Luotettavan toiminnan varmistamiksi ja ylilämiseksi näitä aukkoja ei saa sulkea tai peittää. Mitään esineitä ei saa työntää tuuletusaukkoihin. Mitään nestriä ei saa kaataa yksikköön.

Tuote on varustettu 3-jjohtimisella maadoitetulla verkkipistokkeella. Tämä on turvallisuustoiminne eikä sitä saa poistaa.

Älä kytke audiotehovahvistimen lähtöjä suoraan mihinkään yksikön liittimeen.

Sähköiskun ja palovaaran välttämiseksi yksikkö ei saa olla sateessa tai kosteassa, eikä sitä saa käyttää märässä ympäristössa.

Älä käytä yksikköä jos se on pudonnut, vaurioitunut, kostunut, tai jos sen suorituskkyky on huomattavasti muuttunut, maikä vaatii huoltoa.

Yksikön saa avata vain laitteeseen perehtynyt huoltohenkilö. Kansien poisto altistaa sinut vaarallisille jännittelille.

Tämä kolmio, joka esiintyy homponentissasi, varoittaa siua eristämättömän vaarallisen jännitteen esiintymisestä yksikön sisällä. Tämä jännite saattaa olla riittävä korkea aiheuttamaan sähköiskuvaaran.

Tämä koimio, joka esiintyy komponentissasi, kertoo sinulle, että tässä tuotedokumentoinnissa esiintyy tärkeitä käyttö-ja ylläpite-ohjeita.

Norsk
Viktig informasjon om sikkerhet

Ta vare pådenne veiledningen for senere bruk.

Følg alle anvisningene og advarslene som er angitt på apparatet.

Apparatet skal alltid anvendes med korrekt spenning.

Produktbeskrivelsen inneholder spesifikasjoner for strømkraav. Vær oppmerksom på at det ved ulike driftsspenninger kan være nødvendig å bruke en annen ledningog/eller støpseltype.

Apparatet skai ikke monteres i skap uten ventilasjon, eller direkte over varmeproduserende utstyr, som for eksempel kraftforsterkere. Den maksimale romtemperaturen som står oppgitt i produktbeskrivelsen, skal overholdes.

Apparatet er utstyrt med ventilasjonsåpninger. For at apparatet skal være pålitelig i bruk og ikke overopphetes, må disse åpningene ikke blikkeres eller tildekkes. Stikk aldri noe inn i ventilasjonsåpningene, og pass på at det aldri søles noen form for væske på apparatet.

Dette apparatet er utstyrt med et jordet støpsel. Dette er en sikkerhetsforanstaltning som ikke må forandres.

Utgangsplugger fra audioforsterkere skai aldri koples direkte til apparatet.

Unngå brannfare og elektrisk støt ved å sørge for at apparatet ikke utsettes for regn eller fuktighet og ikke anvendes i næheten an vann.

Apparatet skal ikke brukes hvis det har blitt utsatt for støt, er skadet eller blitt vått, eller hvis endringer i ytelsen tyder på at det trenger service.

Dette apparatet skal kun åpnes av fagfolk. Hvis dekselet fjernes, utsettes man for livsfarlig høyspenning.

Komponenten er merket med denne trekanten, som er en advarsel om at det finnes uisolert, farlig spenning inne i kabinettet…høy nok til å utgjøre en fare for elektrisk støt.

Komponenten er merket med denne trkanten, som betyr at den tilhørende litteraturen inneholder viktige opplysninger om drift og vedikehold.

Svenska
Viktiga säkerhetsföreskrifter

Spara dess föreskrifter för framtida bruk.

Följ alla anvisningar och varningar som anges på engeten.

Använd alltid rätt nätspänning. Se tillverkarens bruksanvisningar för information om effektkrav. Märkväl, att andra matningsspänningar eventuellt kräver att en annan typs nätsladd och/eller kontakt anänds.

Installera inte enheten i ett oventilerat stativ, eller direkt ovanför utrustningar som avger värme, t ex effektförstärkare. Se till att omgivningens temperatur vid drift inte överskrider det angivna värdet i produktspecifikationen.

Behållaren är försedd med hål och öppningar för ventilering. För att garantera tillförlitlig funktion och förhindra överhettning får dessa oppningar inte blockeras eller täckas. Inga föremål får skuffas in genom ventilationshålen. Inga vätskor får spillas på enheten.

Produkten är försedd med en jordad 3-trådskontakt. Detta ä en säkerhetsfunktion som inte får tas ur bruk.

Anslut aldrig audioeffektförstärkarutgångar direkt till någon av enhetens kontakter.

För att undvika elstöt eller brandfara får eenheten inte utsättas för reegn eller fukt, eller användas på ställen där den blir våt.

Använd inte enheten om den far fallit i golbet, skadats, blivit våt, eller om dess prestanda förändrats märkbart, vilket kräver service.

Enheten får öppnas endast av behörig servicepersonal. Farliga spänningar blir tillgängliga när locken tas bort.

Denna triangel, som visas på din komponent, varnar dig om en oisolerad farlig spänning inne i engeten. Denna spänning är eventuellt så hög att fara för elstöt föreligger.

Denna triangel, som visas på din komponent, anger att viktiga bruksanvisningar och servideanvisningar ingår i dokumentationen i fråga.

JBL Synthesis SDEC-1000/ SDEC-2500 Installation Guide:

The SDEC-1000/2500 is a dealer installed digital equalizer and time correction unit. It is part of the Synthesis home theater package. This Installation Guide will supply all the necessary information for the operation of the SDEC-1000 with Synthesis 1, or the SDEC-2500 with Synthesis 2 and 3.

Introduction:

From its inception, JBL Synthesis has been the answer to the questions: "How do you build a state-of-the-art home theater system and make it sound superb in every installation? How can you be sure all the hardware is compatible?" These were the big questions five years ago – Synthesis was the answer.

Once again, JBL Synthesis moves beyond the competition and is the *answer. The JBL Synthesis Digital Equalizer (SDEC) is a six channel in/seven channel out 20-bit digital audio signal processor. Unlike nearly all other audio components on the market, the SDEC has been designed to work specifically with other Synthesis System components. This narrow application focus has allowed our engineers to design a product with far fewer compromises, resulting in unequalled system performance. By reading the following pages, you will become familiar with the technological features and unique capabilities incorporated within the SDEC and available nowhere else.*

The Concept:

Visualize a speaker system with the highest performance components available. Imagine that you have the power of 20-bit digital signal processing available to correct any remaining system non-linearity. Fantasize about crossovers that are theoretically perfect, and time-domain correction delivering idealized impulse response.

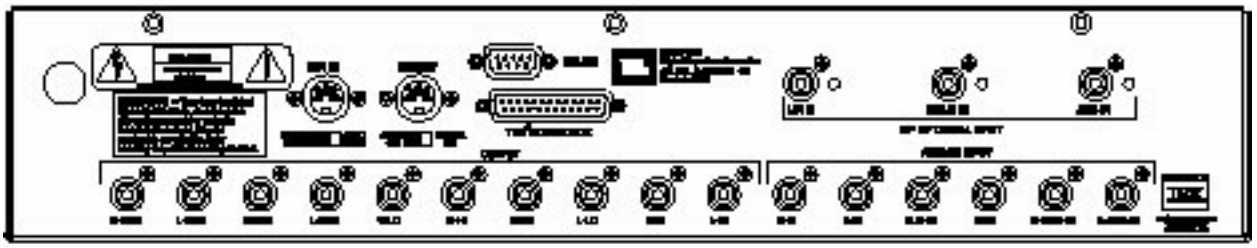
The fun doesn't stop there. Now that this perfected speaker is in the room, you've got arrival time correction, multipositional spatially averaged measurements and scientifically derived target response curves for each speaker, multiband parametric equalizers, auto-EQ algorithms and compensation for perforated video projection screens! How good would all this be? In a few words, "very, very good"!

Okay, stop dreaming. It's here, now. (It's in that box over there, and you're going to install it and make someone very happy!) The JBL Synthesis Solution™. The SDEC and the Digital Acoustic Calibration System (DACS) together can achieve what others only dream about.

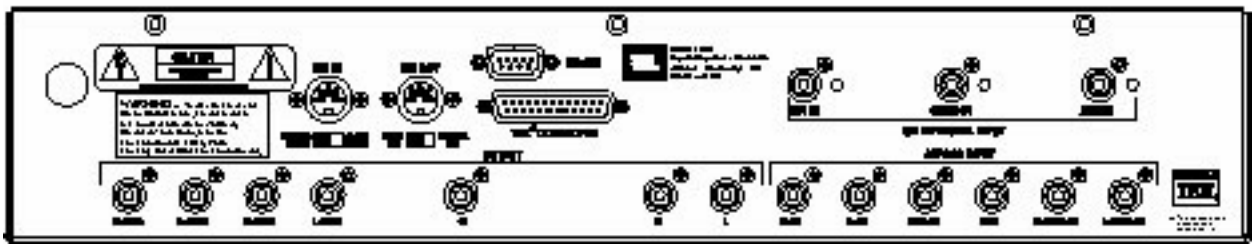
Properly used, a high-quality equalizer can improve the overall sound quality of most systems. However, there are many areas of a speaker's behavior that can be improved, but only if you know, in advance, what the speaker needs. The Synthesis solution allows this to be a reality. Until now, anything beyond the most basic equalization has been impossible without expensive acoustical instrumentation and the knowledge to use it. This is why, traditionally, equalizers have been general-purpose devices, designed to be applicable to any audio system, usually of doing more harm than good!

Add to this situation the fact that equalizing a speaker system by ear is truly a futile exercise. This helps to account for the generally low acceptance of equalizers outside of professional audio applications.

2.1
SDEC-1000 REAR PANEL
SDEC-2500 REAR PANEL

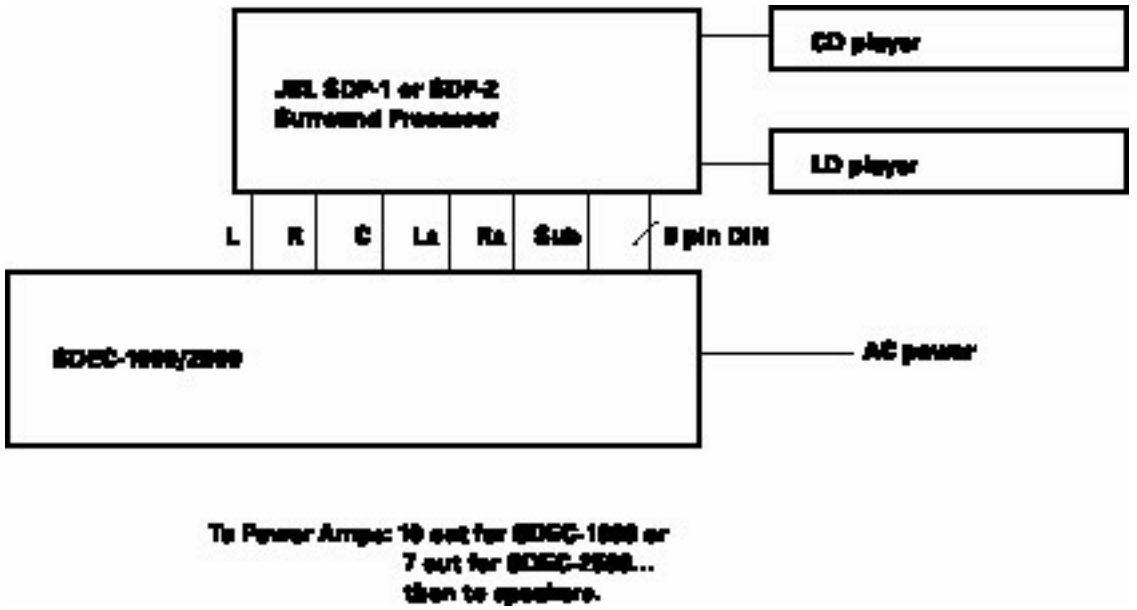


SDEC-1000 Rear Panel



SDEC-2500 Rear Panel

System connection after dealer installation and calibration.



2.2
WHAT THE SDEC DOES

The SDEC, available in two models that differ only slightly in function, is a digital signal processor capable of performing several functions simultaneously. In general, the device is fed signals from the surround processor (the Synthesis SDP-1, 2 or 2D) that have been separated into discrete left, center, and right front channels, side and/or rear surround signals, and subwoofer/lfe (low-frequency effects) signals.

By converting these six signals into digital bitstreams, and feeding them into a DSP (digital signal processing) engine using extremely powerful Motorola processors, the signals can be manipulated in the digital domain to achieve several desired results.

Driver correction, arrival time manipulation, room correction, and frequency division are some of the tricks easily done by what amounts to a powerful, special-purpose computer, but which would require inordinate complexity (and would result in signal-quality degradation) if done in the analog domain. After processing, high-quality digital-to-analog converters return the signals to the analog domain, and pass them on to Synthesis amplifiers.

What the SDEC does:

Driver EQ:

The drivers used in Synthesis systems are designed and manufactured to reproduce both music and the audio associated with cinema as faithfully as possible. But real-world mechanisms, however well crafted, have limitations imposed on their operation due to the nature of available materials and the inescapable laws of physics. Because the SDEC is used only in Synthesis systems and, therefore, is only used with a small number of different drivers, programs can be loaded into it to smooth out response irregularities, compensate for manufacturing tolerances, etc. Tell the system during installation whether it's a Synthesis I, II, or III and corrections, programmed at the factory by JBL engineers, are instantly applied to make very good drivers sound even better.

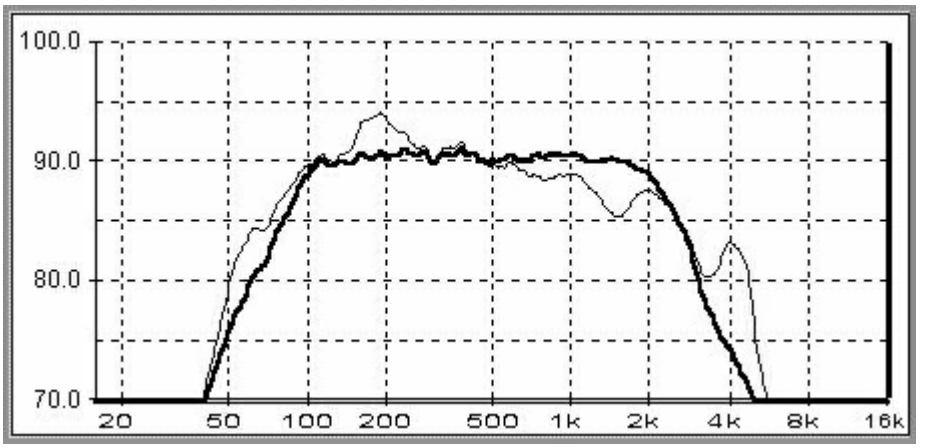


Figure 1:
Raw Driver Response/Corrected Driver Response

Driver Time Correction:

Once again, because the SDEC "knows" what speakers it's being used with, it can correct for the different arrival times of sounds from low- and high-frequency drivers. Arrival times are slightly different because the horns, tweeters, and midrange drivers are mounted at somewhat different distances from the listener. The SDEC can delay the sound coming from the closer drivers slightly, so that all frequencies impinge on the listener's ears simultaneously, reducing acoustic "smear". All the frequency components that comprise complex waveforms arrive together; the end result is greater fidelity to the original waveshape.

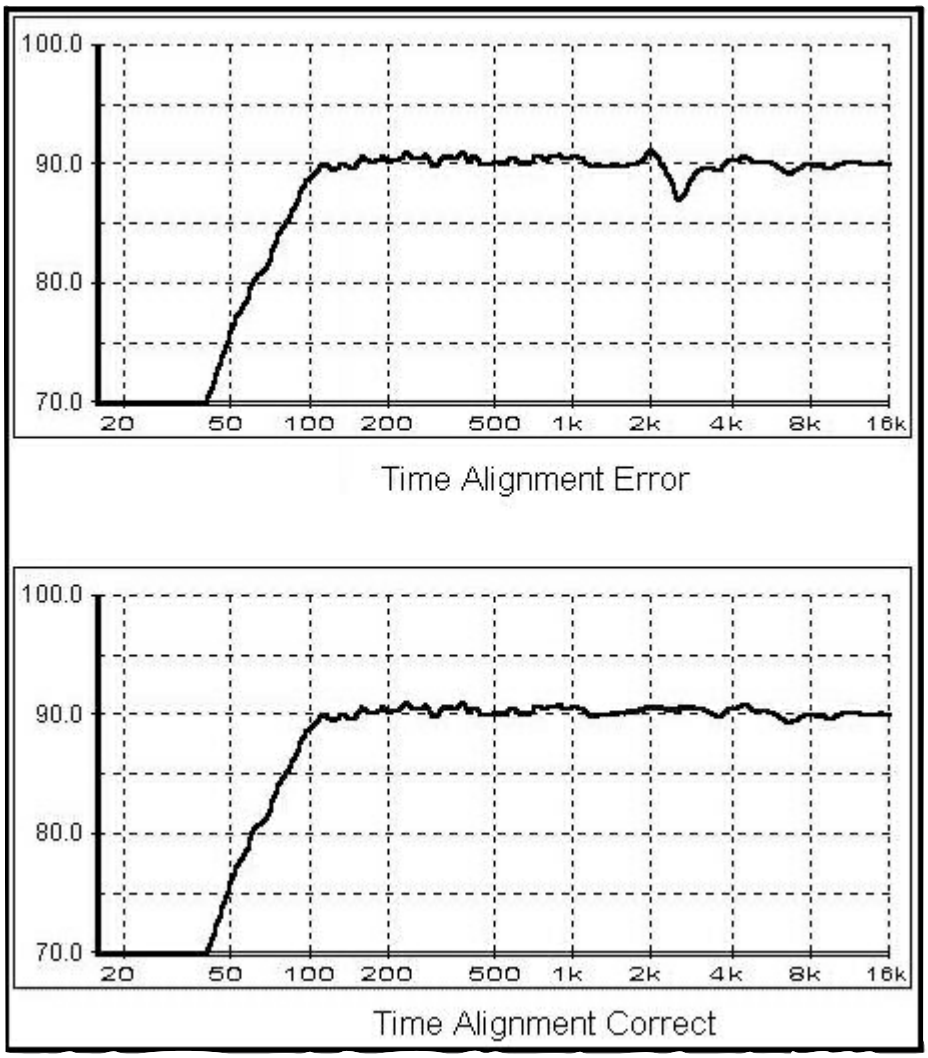


Figure 2:
System With and Without Driver Time Correction

Channel to Channel Distance Correction (Auto-Time Correction):

The listener's preferred listening location doesn't always coincide with the "acoustically best" position; furniture placement, screen location, traffic patterns and other factors can keep us from sitting where "sound sounds best", typically determined by speaker placement geometry. The SDEC can compensate for unequal distances to loudspeakers and move the "sweet spot" to the listener. This feature is called "Auto-time arrival correction" in the Synthesis system.

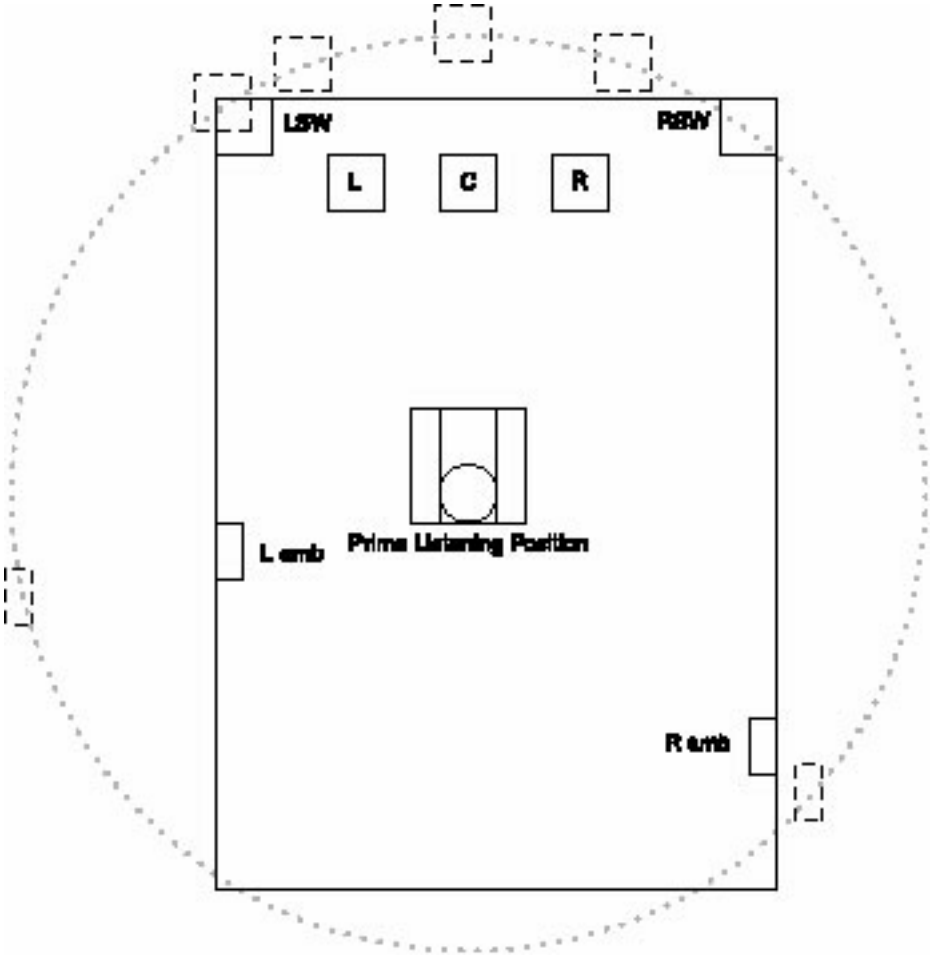


Figure 3:
Effect of Auto-Time Correction

Crossovers:

The SDEC-1000 (used in bi-amplified Synthesis I systems) performs the function of electronic crossover in addition to its other tasks. This allows for more precise transducer correction and all other attendant advantages of bi-amplification. The crossovers are 24dB per octave (4th order) Linkwitz-Riley type. This high-performance class of filter is rarely attempted in passive crossover designs due to its inherent complexity.

Screen Correction:

The computational power of the SDEC allows it to compensate for the effects of placing the front center channel loudspeaker behind any of several popular types of projection perforated screen material.

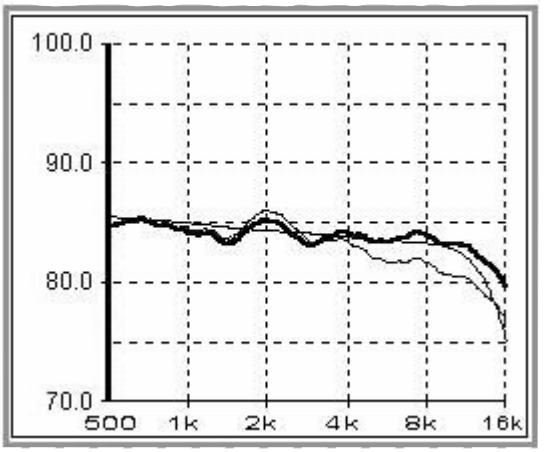


Figure 4:
Effect of Screen Correction EQ

Modes:

Although not a major consideration before the advent of home theater, inherent differences exist between an idealized music-only and an idealized cinema sound reproduction system. Cinema sound is produced with using theater speakers that employ horn-loaded compression drivers. The directivity-index of horn-loaded drivers is significantly different from that of direct radiator designs. The best way to reproduce cinema audio is with speakers that exhibit similar directivity characteristics.

Synthesis systems employ horn-loaded drivers for cinema and direct radiators for music.

The SDEC contains two sets of equalization curves selected by the system controller for each of the Synthesis I, II, and III systems. Sources identified by the SDP-2 or the more recent DTS-equipped SDP-2D as music-only are fed through conventional midrange cone drivers and dome tweeters; theatrical audio is automatically fed to horn-based transducers, and equalization is changed to the appropriate settings.

Room Correction EQ:

The parameter (or, more accurately, set of parameters) more responsible for overall sound quality than almost any other is the acoustic signature, or characteristics, of the listening environment. Absolute room dimensions, the ratio of the room dimensions, the shape of the room, absorption/reflection characteristics of the walls, and room furnishings can make the most expensive equipment sound mediocre or enhance the sound of mediocre equipment. In this area, the SDEC is

nothing less than magic! With 90 available bands of parametric equalization (each adjustable for center frequency, amount of boost or cut, and bandwidth (the reciprocal of Q), its ability to address the specific problems of a given environment is far beyond any graphic equalizer. Typically, such devices are two-edged swords, able to cause at least as many problems as they solve. In this case, however, a preprogrammed computer, using proprietary algorithms developed over a period of several years by JBL, guides the automatic adjustment process, transforming acoustic torture chambers into acoustically superior environments. The essential ingredient necessary for success is knowledge of what can and cannot be corrected with equalization.

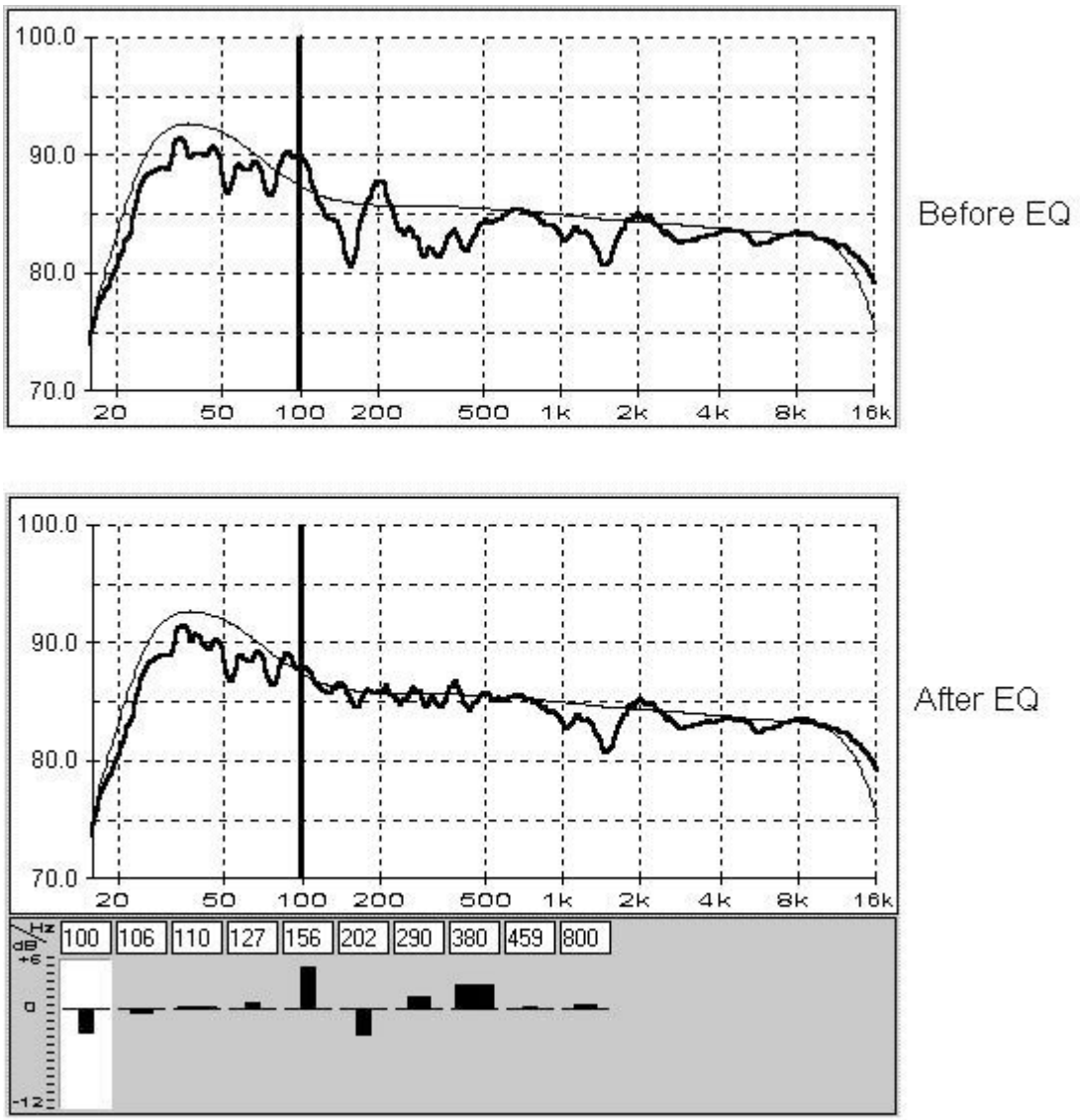


Figure 5:
Effect of Room EQ

Location, location, location…

(Please note that this installation guide assumes a U.S. location, in which the power source is 120 volt, 60Hz. JBL can supply the SDEC for use in 230 volt, 50Hz environments on special order. Contact JBL for details and delivery information.)

Pick a location, determined by the relationship to other equipment and power availability. Note that there are NO user controls on the SDEC: it need NOT be located where the user can easily reach it. Once programmed, it is turned On AND Off by trigger signals from the Synthesis SDP-1, 2 or 2D, and, in turn, triggers the power amplifiers on and off. It can be located close to the surround processor/decoder or close to the power amplifiers, although it should NOT be subject to the heat they generate. For this reason, it may be better to locate it near the surround processor.

To simplify the following discussion, it will be assumed that the surround processor/decoder is a Synthesis SDP-2D, although it may be an earlier SDP-1 or SDP-2. The SDP-1 is a Dolby® Pro Logic® decoder and control system, while the SDP-2 incorporates the ability to decode AC-3® signals from DVD players or laser disc players equipped with RF demodulators, such as the Synthesis SDP-RFD. The SDP-2D, the newest addition to the Synthesis family of controller/processors, adds DTS decoding capability, while retaining AC-3 and Pro-Logic modes of operation. In subsequent discussion, the word "controller" will be used to indicate the SDP-1, 2 or 2D, or whatever alternate equipment is being used to select input sources and control power to "downstream" pieces of signal processing equipment.

Frequently, the SDEC will be retrofitted to a Synthesis system previously equipped with an analog equalizer. It can be mounted in place of the old equalizer and mode switching equipment, and will require considerably less space. A minor amount of rewiring will be necessary. This is covered in CASE I, below. CASE II covers new installations of Synthesis systems.

A note on wiring:

There are four types of wiring systems associated with all Synthesis systems:

- *Signal wiring: RCA-to-RCA type interconnects will serve to route analog audio signals between the surround processor, the SDEC and the power amplifiers. Only high-performance interconnects should be used. A pre-fabricated set of cables is provided with the SDEC. Any additional interconnects added to the system should be of equal or greater quality to ensure trouble-free operation.*
- *Speaker wiring: Only high-performance, heavy gage speaker wire should be used. Any wire-runs through or within walls must conform to local flammability requirements and be appropriately marked; CL-3 is one example of such a rating. Refer to the Synthesis S-400/S-650 Power Amplifier User's Manual for more information about selecting appropriate speaker wires.*
- *AC power: It is recommended that the system be connected to a dedicated 20-amp AC circuit. If this is not an option, try to avoid using an AC circuit that is shared with heavy appliances. Never connect any Synthesis equipment into a switched outlet. Removing the AC power while the system is ON will cause no permanent damage, but may lock up its microprocessors, necessitating turning the system fully off, then on again. It may also cause loud pops and clicks in the loudspeakers.*
- *Control lines: All Synthesis components communicate with one another via a standard DIN connection cable. This cable enables automatic power an mode switching of the entire system from the surround processor.*

Wiring Connections to the SDEC:

Case I – Replacing an analog equalizer in an existing Synthesis system:

- *Turn all equipment OFF and disconnect the AC power before beginning.*
- *Disconnect and remove the analog equalizers and all associated equipment, wiring and hardware.*
- *Physically install the SDEC. Refer to Section 3.1 "Location, Location, Location" for more information about selecting an appropriate location for the SDEC.*
- ⚠ *NOTE: Refer to Section 6 "Interconnection Diagrams" and Section 7 "Control Wiring Diagrams". Locate the diagram that illustrates the system you are installing. Use that diagram for the following steps.*
- *Confirm that all interconnects and control lines are connected as shown in Sections 6 and 7. All necessary control lines and interconnects have been provided. If necessary, you may re use any applicable interconnects or control lines removed from the analog hardware.*
- ⚠ *NOTE: The DIN control line connections for the SDEC are significantly different from the analog EQ's. Failure to conform to the routing indicated in Sections 6 and 7 will cause control problems.*
- *There are 9-pin and 25-pin "sub-mini D" connectors on the rear panel of the SDEC. The 9-pin, labeled "RS-232" is only for use during calibration and restoration activities; it is NOT intended for connection to home automation systems, such as AMX or Crestron. The 25-pin is in parallel with the input jacks, following THX wiring convention. It is not used with current Synthesis surround processors.*
- *On the rear panel of the SDEC are two slide switches with recessed handles. Unless you are installing a CINEMA-only system, use a pencil or straightened paper clip to place both switches in the "AUTO" position. If you are installing a CINEMA-only system, you must put the left switch in the 'CINEMA MODE" position. This prevents the SDEC from ever going into "MUSIC MODE" regardless of control signals received from the surround processor.*
- ⚠ *NOTE: Mode -switching occurs as inputs are selected. Whenever the SDEC is asked to change modes, the system output is muted for approximately two seconds while the appropriate equalization settings are loaded into the DSP. This is analogous to loading a program into a computer.*
- *The right switch determines the mode of AC power control. Normally, the switch should be left in the "AUTO" (left) position. In "AUTO", the SDEC will be turned on and off by the surround processor. In the "MANUAL ON" (right) position, the SDEC is controlled only by the front panel push button.*
- ⚠ *NOTE: The "AUTO ON" feature only works when the front panel push button is pressed in. If this push button is released, the SDEC will remain off.*
- *Connect the power cord of the SDEC to a suitable 120 volt, 60Hz power source. Refer to Section 3.2 "A Note on Wiring" for additional information about AC power wiring. A red LED will illuminate the clear plastic escutcheon surrounding the power switch.*
- *Reconnect the power amplifiers to their power outlets.*
- *Turn on all equipment except the surround processor.*
- *Test the system by turning the surround processor on.*

- *The first time SDEC is powered, it may take up to 30 seconds to "boot". After system calibration is complete, boot time is reduced to about ten seconds. When boot is complete, the red light around the power switch goes off, and an amber LED in the center of the front panel comes on.*
- *Select an active program source. At this time, confirm that all channels are working. Now select another "effect" on the surround processor that triggers a mode change. Confirm that all channels are still operating normally. Remember, as the system is no longer calibrated, it probably will not sound the way it did when you started. If all channels are working normally, you are now ready for connection to the Digital Audio Calibration System for complete equalization.*
- *If the system is not performing as expected, refer to "Troubleshooting" in Section 4.7.*

Case II – Installing an SDEC as part of a new Synthesis system installation:

- *Install the surround processor, signal sources, power amplifiers, and speakers appropriately. The SDEC can be located near the surround processor or power amplifiers, but should not be subjected to excess heat; do not put it above an amplifier in a rack unless excellent ventilation is provided. There are NO user controls on the SDEC; it is not necessary to locate it within the operators reach. Its settings cannot be changed without the use of the DACS (Digital Audio Calibration System) equipment.*
- ⚠ *NOTE: Refer to Section 6 "Interconnection Diagrams" and Section 7 "Control Wiring Diagrams". Locate the diagram that illustrates the system you are installing. Use that diagram for the following steps.*
- *Confirm that all interconnects and control lines are connected as shown in Sections 6 and 7.*
- *On the rear panel of the SDEC are two slide switches with recessed handles. Unless you are installing a CINEMA-only system, use a pencil or straightened paper clip to place both switches in the "AUTO" position. If you are installing a CINEMA-only system, you must put the left switch in the 'CINEMA MODE" position. This prevents the SDEC from ever going into "MUSIC MODE" regardless of control signals received from the surround processor.*
- ⚠ *NOTE: Mode -switching occurs as inputs are selected. Whenever the SDEC is asked to change modes, the system output is muted for approximately two seconds while the appropriate equalization settings are loaded into the DSP. This is analogous to loading a program into a computer.*
- *The right switch determines the mode of AC power control. Normally, the switch should be left in the "AUTO" (left) position. In "AUTO", the SDEC will be turned on and off by the surround processor. In the "MANUAL ON" (right) position, the SDEC is controlled only by the front panel push button.*
- ⚠ *NOTE: The "AUTO ON" feature only works when the front panel push button is pressed in. If this push button is released, the SDEC will remain off.*
- *There are 9-pin and 25-pin "sub-mini D" connectors on the rear panel of the SDEC. The 9-pin, labeled "RS-232" is only for use during calibration and restoration activities; it is NOT intended for connection to home automation systems, such as AMX or Crestron. The 25-pin is in parallel with the input jacks, following THX wiring convention. It is not used with current Synthesis surround processors.*
- *Connect each amplifier to its loudspeaker. Refer to Section 3.2 "A Note on Wiring" for additional information about speaker wire selection.*
- *Connect all system components to a suitable 120-VAC power source. Refer to Section 3.2 "A Note on Wiring" for more information about AC power connections. The SDEC will be in standby mode as soon as AC power is supplied. Standby is indicated by red illumination of the escutcheon around the power push button.*

- *Turn on all equipment except the surround processor. At this time all Synthesis components should remain in standby.*
- *Now turn on the surround processor. After a few seconds, the Synthesis components should power up. First, the SDEC will go from standby to on, followed by the amplifiers, one channel at a time.*
- *The first time SDEC is powered, it may take up to 30 seconds to "boot". After system calibration is complete, boot time is reduced to about ten seconds. When boot is complete, the red light around the power switch goes off, and an amber LED in the center of the front panel comes on.*
- *Select an active program source. At this time, check that all channels are working. Now select another "effect" on the surround processor that triggers a mode change. Confirm that all channels are still operating normally. If all channels are working as anticipated, you are ready for connection to the Digital Audio Calibration System for equalization. Should time not permit system calibration immediately, it can be used "as is" temporarily. The SDEC will simply pass signals through with no signal processing.*
- *If the system is not performing as expected, refer to "Troubleshooting" in Section 4.7.*

Power the system up for the first time:

With all power switches "off", plug all equipment into power outlets. Turn on the SDEC by pressing the front panel push button. Turn on the controller (typically first with a rear-panel master power switch, after which it will go through an initialization procedure, then from a front panel switch or remote control). The red light around the SDEC's power switch should go off and the yellow LED in the center of its front panel should light within 30 seconds. (After the SDEC is programmed, the turn-on time is considerably shorter.) After a few seconds, the rest of the system should be on and ready for operation.

- *Select a convenient source. The SDEC should route all channels to the appropriate loudspeakers, but will provide no driver, time, or room correction.*
- *It is now ready for connection to the Digital Audio Calibration System for complete setup and equalization. Should time not permit system equalization immediately, the system can be used "as-is" until the process can be completed. The SDEC will simply pass signals through, with no equalization.*

4.0 THE DIGITAL ACOUSTIC CALIBRATION SYSTEM

When the physical installation of any Synthesis System is complete, the next step is to calibrate the system to meet factory performance specifications. This is accomplished with the use of the proprietary JBL Synthesis Digital Acoustic Calibration System (DACS4). DACS4 is a computer controlled acoustic measurement system that communicates directly with the SDEC-1000/2500. After each channel is analyzed, corrective settings are transmitted to the SDEC. These settings are stored in non-volatile memory, thus assuring that the settings are permanent. Normally, re-calibration of an SDEC is not required. There are no controls on the SDEC that can disturb the memorized settings.

Operational Overview:

Proper calibration of an audio playback system is a very complex undertaking. The first requirement is to acquire test data that accurately portrays what is actually happening in the room. Second, we must post-process this data to create a view that is relevant to what we actually hear. Third, this data must be compared to some theoretical ideal. Last, corrective action must be taken to make the actual listening environment more closely match the ideal. Properly administering this process is usually a good day's work even for an experienced acoustics engineer using sophisticated analysis devices. Using DACS4, you will be able to perform this work in a few hours time.

Stimulus:

DACS4 uses pink weighted pseudo-random noise to stimulate the speakers for each test. This stimulus is used because it contains equal energy per octave, and all frequencies from 16Hz to 20kHz are represented. The stimulus level is preset to generate a sound level of 85dBC when the system is properly calibrated.

Data Acquisition:

Meaningful acoustic measurements cannot be accomplished by placing a microphone at a single position in the room and running a test. The key premise of room equalization at low frequencies is that the equalization will be used only to correct for excessive energy found in specific room resonances It must not be used to correct for narrow, deep, dips caused by destructive acoustical interference. A measurement made at a single point cannot effectively identify resonances and cannot discriminate against the relatively harmless acoustical interferences. The only effective method of separating room resonances from acoustical interference is to sample the acoustic energy at several points in the room. DACS4 employs five microphones distributed throughout the listening area. When the data acquired from these microphones is spatially averaged, the resultant curve has effectively "averaged out" most of the destructive interference components while still reporting on major room resonances. This is so because acoustical interferences occupy very

small spaces within the room (will only be seen on a single microphone) while low-frequency resonances will be found over a much larger area. This technique assures that no single-point room anomaly will dominate the measurement unless, of course, it is severe enough to exist at many locations, as resonances tend to do. As you can see in Figure 8, the dips tend to average out, while the peaks get reinforced. Exactly what we want to do.

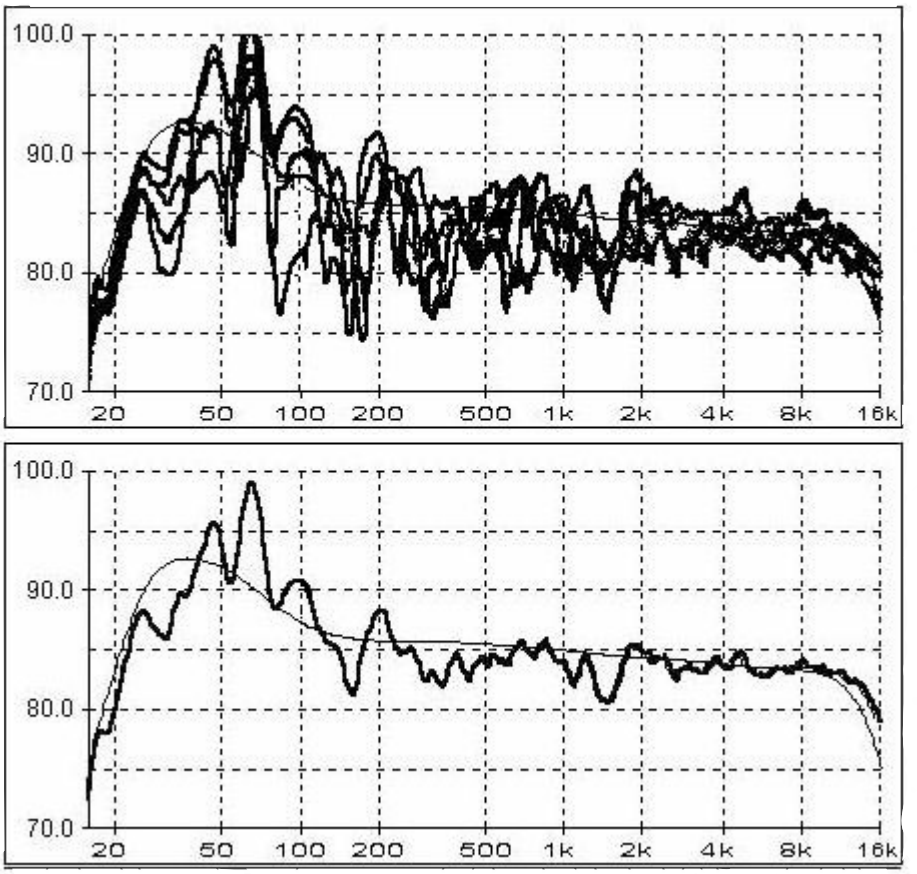


Figure 6:
System Response in Five Locations.
Lower Trace is the Spatially Averaged Result, Prior to EQ

Data Post-Processing:

A Microphone Multiplexer (SMM-5) scans the microphones sequentially and forwards the data to the EVP. All analysis computations are performed in the EVP. The data from the individual microphones is spatially averaged into a single block of data. This is a reliable indicator of the average frequency response of the system throughout the listening area.

To this energy vs. time data a Fast Fourier Transform (FFT) algorithm is applied. This conversion yields the familiar amplitude vs. frequency data.

Display Data:

DACS4 uses the laptop computer to display the results of each test. This data is plotted on an X-Y graph in a familiar format, Amplitude vs. Frequency. In addition to the response data, there is also a "target" response curve present on the same graph. The target curve is specific to the Synthesis model, mode of operation and channel being tested. This allows you to quickly see how far from the ideal you actually are. As additional tests are performed, they can be added to the display at will, allowing comparison between channels.

Make Corrections:

When you initialize DACS4, you input information about the Synthesis model being calibrated. With this, DACS4 loads configuration information into the SDEC, which customizes it for use with the particular model, whether Cinema only or Cinema + Music, and even compensates when the speakers are placed behind a perforated screen. At the same time, appropriate target curves are loaded into memory.

DACS4 allows manual adjustment of as many as fifteen bands of parametric equalization. However, it is much easier to let the computer do it for you. To this end, DACS4 incorporates a very sophisticated automatic EQ algorithm.

In addition, DACS4 performs auto-time correction. This routine determines the time arrival variance from channel to channel and programs the SDEC to add delay as needed to normalize all channels to the same arrival time.

At the conclusion of the calibration session, all settings are transmitted to the FLASH EPROM in the SDEC and made permanent (burned).

- ***Target Curves:***

  Intuitive logic would tend to indicate that the best sound would be achieved when the system delivers flat frequency response. While this is true for all other components in the audio chain, this is definitely not true in the case of loudspeakers installed in listening rooms. There are several reasons for this, and it has taken many years of research to establish just what the most desirable performance characteristics are.

  - ***Ideal Low-Frequency Response***

    Room boundaries (walls, ceiling and floor) tend to contain low-frequency energy within the room. Simply stated, this results in a boost in low-frequency energy. This is true whether it is a speaker or a piano producing the sound. The exact frequency at which this effect begins and the amount of boost realized are a function of the room size, shape and wall construction. No two spaces are ever exactly alike. This same low-frequency enhancement also occurs in recording studios, and the recording engineers know this will occur during playback. They balance their recordings in anticipation of this. Therefore, it would be wrong to "flatten" the speaker system response in the playback environment. To do so only results in a thin bass sound.

    By surveying many listening rooms over the years, JBL engineers have established a low-frequency response characteristic that delivers the most consistently satisfactory results. This has been confirmed through extensive subjective evaluation tests.

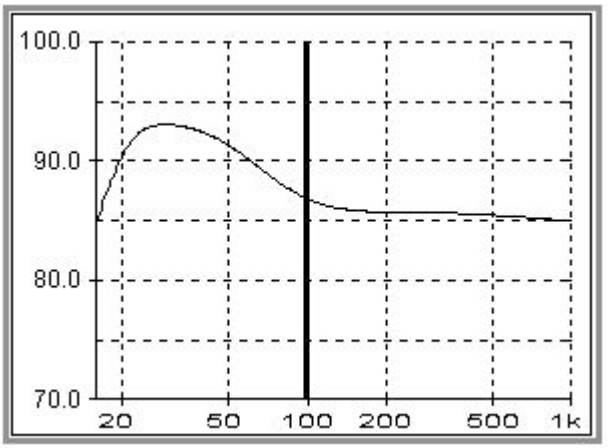


Figure 7:
Synthesis 1 Main Target Curve, Below 1kHz

- ***Ideal High-Frequency Response***

  Above a few hundred Hz, the perception of sound quality, or timber, is determined by a complex combination of the direct sound – the first arrival at the listener's ears, the early reflected sounds – those sounds that have reflected from the floor, ceiling and the side walls, and the reverberant sounds – sounds that arrive after many reflections, from many directions over a period of time. Two ears and a brain are powerfully analytical of this soundscape, and they arrive at a kind of "weighted" combination of them. All of the components are important, but not equally so, and not always so, depending on the kind of sound that is being listened to.

  We know, from many carefully controlled listening tests, that all three components must be timbrally-neutral in order for a loudspeaker to be rated highly by listeners. The design criteria, therefore, can be summarized as "a flat on-axis frequency response, with a directivity that is constant as a function of frequency". This is something that can only be measured properly in a laboratory, during speaker design. Once they are installed in a room, it is difficult to impossible to make measurements that reveal this behavior of the speakers.

  In a room, all of the sounds are mixed together, arriving at the measurement microphone at different times, from different incident angles. While two ears and a brain deals with such sounds in different ways, the "dumb" measurement system has no such discrimination capability. The room measurement, therefore, while not entirely useless, is an unreliable indicator of what a listener hears except, perhaps, in the gross sense of overall sound level.

The fact that the "room curve" is not perfectly flat should not be upsetting. One would expect a gentle high-frequency rolloff from even the most perfect loudspeaker. The absorption of high frequencies by drapes, carpets, upholstered furniture, etc. ensures that not all of the radiated energy reaches the listener, or microphone. it is much the same in recording studios, so this is part of the normal playback circumstances. If the speakers have been properly designed to begin with, it matters little what the room curve looks like at high frequencies. Synthesis speakers are properly designed. In fact, attempting to adjust the room curve may undo a lot of careful design effort on the part of the speaker engineers.

The Synthesis target curves are derived from data collected in many typical installations. They represent a trend of what should be expected, not a specific shape that must be achieved for good sound. They help in the setting of overall levels, and are useful for diagnostics or troubleshooting.

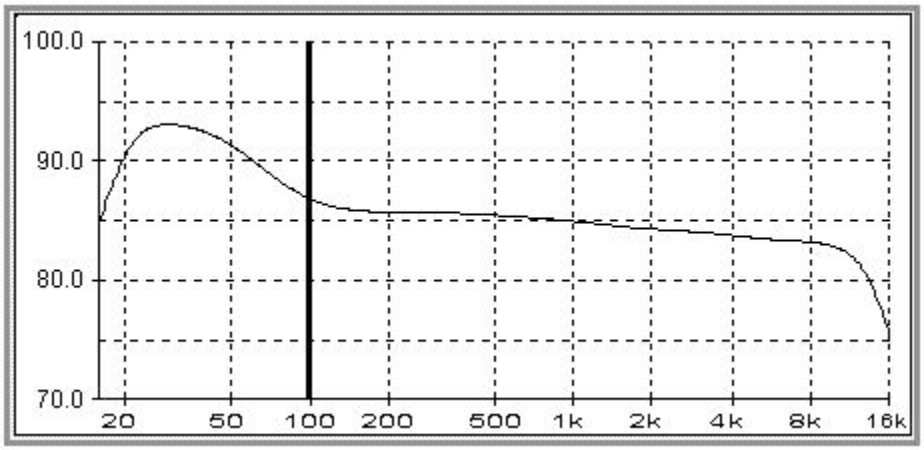


Figure 8:
Complete Synthesis 1 Target Curve

DACS4 Connections and Use:

The following instructions are written on the assumption that the Synthesis system installation is complete and that basic functionality of the system has been confirmed. If this is not so, please refer to the system installation documentation.

It is also assumed that the installation uses standard Synthesis components in a standard five-channel + subwoofer configuration. If this is not so, please refer to alternate configuration documentation or call your JBL Synthesis representative for specific instructions.

⚠ *Do not attempt to connect the DACS4 hardware to Synthesis while the system is on.*

Things To Consider When Selecting A Location For DACS4:

The complete system calibration will take two-to-three hours; therefore, you should give the location of the test setup some thought. Try to set up DACS4 in a comfortable location within the room to be calibrated. Here are some locations to avoid:

1. *Directly in front of any speaker*
2. *In a traffic lane*
3. *Any location that prevents you from seeing the SDP-2 front panel or the projector screen*
4. *Any location that interferes with remote control operation*
5. *In the main seating area (this is where the microphones will be)*
6. *On the floor*

⚠ *Whatever location you choose, use reasonable caution when laying interconnect cables around the room. Cables crossing traffic lanes should be taped down to diminish the tripping hazard loose wires represent. Of course, this would also put the DACS4 hardware in jeopardy.*

Hookup:

Use the following diagram to connect the DACS4 system to Synthesis:

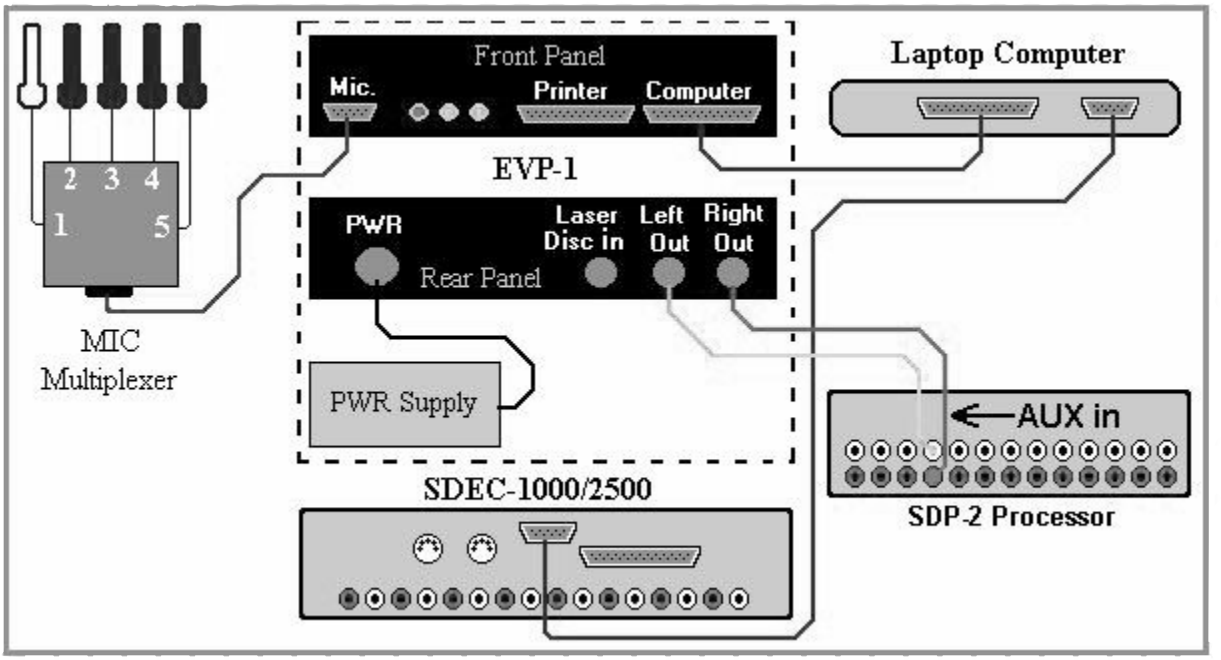


Figure 9:
DACS4 Connection to Synthesis

- ***AC/Power Connections***

  The EVP-1 and the laptop computer use in-line power supplies. Connect these power supplies to their respective devices before you connect them to the AC supply. The power connector for the EVP-1 is located on the left side of the front panel while the connector for the laptop computer is located on the right side of the computer's rear panel. If possible, connect these supplies to the same AC circuit as the Synthesis System components. There is no power switch on the EVP. When you plug the power supply into the AC supply, a red LED on the rear panel will light. Do not power up the computer at this time.

⚠ *Using the same AC outlet for all devices will minimize ground circuit current, which manifests itself as audible hum in the speakers and popping noises during data transmission from the EVP-1to the SDEC. Some low level AC-induced noise is normal. This is because the DACS4 power supply and the laptop computer were not designed to be high-quality audio devices. If you must connect the DACS4 hardware to a different AC circuit, the potential for hum is greatly increased. When excessive hum is encountered, isolate the third wire ground connection of the EVP-1 power supply from the AC supply.*

- ***Audio Connections***

  On the front panel of the EVP-1 are two RCA connectors labeled "RIGHT OUT" and "LEFT OUT". Using the stereo 25' RCA cable provided, connect these outputs to the "AUX" input of the surround processor.

- ***Other Connections***

  A DB25 cable goes from the LPT1 output of the computer to the mating input connector labeled "COMPUTER" on the back panel of the EVP.

  Connect the 25' DB9 cable provided from the COM1 port on the back of the computer to the DB9 communications port found on the back panel of the SDEC.

  Now connect one end of the special 25' cable provided between the DB9 connector on the rear panel of the EVP-1 labeled "MIC. BOX" and the round multi-pin connector found on the side of the SMM-5. Microphone connections will be covered in detail in the "Microphone Connection and Placement" section of this manual.

⚠ *Many of these connectors have security hardware which, when used, ensures trouble-free operation. Please resist the temptation to attach the connectors without their security hardware. Although this will save you about two minutes during setup, all too often the result is a crashed system or intermittent behavior, which results in a substantial loss of time. Keep in mind that these connectors are subjected to far more insertions than normal. This accelerates wear, loosening the connector pin springs. These connectors are far more likely to fall out from the weight of the cable than it may appear.*

- ***Microphone Connection and Placement***

  The DACS4 calibration kit includes five instrumentation microphones. Each microphone is placed on a telescoping stand. The microphone cables are terminated with an Industry-standard male XLR connector. The barrel of the connector has a slot shaped cutout on one side, near the edge of the barrel. When the slot is facing up, you have the correct orientation for insertion into the SMM-5. The mating jacks on the SMM-5 have a spring-loaded retainer key. When you insert each microphone, you will hear and feel a click when the connection is complete. The retainer key prevents accidental disconnection. To disconnect a microphone, you must press the key and pull the plug simultaneously.

  In the event one or more of the microphones is placed beyond the reach of the cable, you can use the 2-meter extension cables provided in the kit. Any standard four conductor XLR extension cable can be used for this purpose, if necessary. It is recommended that the total length not exceed 9 meters.

  Room Placement

  The SMM-5 is connected to and controlled by the EVP. When you perform a measurement, a discreet data block is gathered from each microphone. These data blocks are then spatially averaged to create a single data block. To ensure accurate measurements, it is vitally important that the microphones be placed optimally within the listening area. See Figure 9 for basic placement guidelines.

How is the Room Used?

Before you can decide microphone placement, you must know how the customer expects to use the room. This is best determined by asking the customer some key questions. For example, ask if they typically entertain several guests when using the theater room. Appropriate microphone placement in this case would be to distribute the microphones throughout the listening area. Conversely, if the most common use is just one or two people, a much tighter placement pattern would be indicated.

Microphone #1

The first task DACS4 performs is Auto-Time Correction. The measurement system performs a quick test on all speakers, using only microphone #1. The analysis of this data determines the distance from microphone #1 to each speaker. The arrival time difference is removed by adding delay to each channel as needed. This has the effect of placing the listener in the center of a circle, with all the speakers placed along its circumference. The benefits are two fold. 1. Impulsive sounds have a more solid "attack" to them and, 2. Sounds that originate from more than one speaker and are highly "correlated" will suffer far less "comb filtering" effects.

The primary listening position is the one seat in the room that is most often occupied. It may surprise you to find that the primary position is not always the front and center seat. Wherever the primary position is, this is where you will place microphone #1. You should place this microphone at ear level. The microphones are not numbered and it does not matter which microphone you select for this position. What does matter is that you plug the chosen microphone into position #1 on the SMM-5.

Now Place the Remaining Microphones

Figure 10 shows a typical seating arrangement. Gridlines have been added to this drawing to clarify the discussion. Vertical lines are labeled numerically (X-axis) while horizontal lines are labeled alphabetically (Y-axis). Whenever an X and Y line intersect, a coordinate point is established. For example microphone 1 is at coordinate point E15. For best measurement results, never place more than one microphone on and X or Y line. Since microphone 1 is at point E15, no other microphone should be placed along the E or 15 gridlines. In this example, the other microphones are placed at points C10, L18, R5 and T25. No coordinate line has been used more than once.

Try to keep any two microphones at least 1' from each other. As a general rule, your imaginary grid spacing should be no less than 6", with 12" or more being preferred. Two microphones closer than this would defeat the desired effect. Try to keep the microphones as widely spaced as possible, but still within the listening area. Following these guidelines assures that each microphone contributes a unique signature, and no axial room mode will dominate the spatially averaged result.

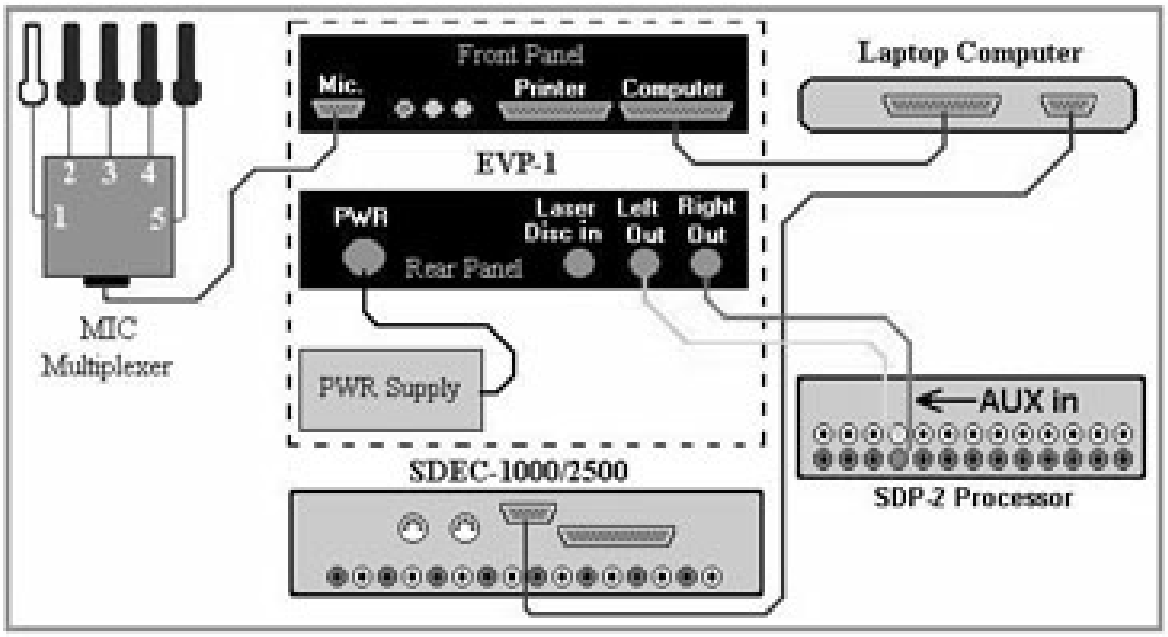


Figure 9:
DACS4 Connection to Synthesis

- ***AC/Power Connections***

  The EVP-1 and the laptop computer use in-line power supplies. Connect these power supplies to their respective devices before you connect them to the AC supply. The power connector for the EVP-1 is located on the left side of the front panel while the connector for the laptop computer is located on the right side of the computer's rear panel. If possible, connect these supplies to the same AC circuit as the Synthesis System components. There is no power switch on the EVP. When you plug the power supply into the AC supply, a red LED on the rear panel will light. Do not power up the computer at this time.

  Using the same AC outlet for all devices will minimize ground circuit current, which manifests itself as audible hum in the speakers and popping noises during data transmission from the EVP-1to the SDEC. Some low level AC-induced noise is normal. This is because the DACS4 power supply and the laptop computer were not designed to be high-quality audio devices. If you must connect the DACS4 hardware to a different AC circuit, the potential for hum is greatly increased. When excessive hum is encountered, isolate the third wire ground connection of the EVP-1 power supply from the AC supply.

- ***Audio Connections***

  On the front panel of the EVP-1 are two RCA connectors labeled "RIGHT OUT" and "LEFT OUT". Using the stereo 25' RCA cable provided, connect these outputs to the "AUX" input of the surround processor.

Power Up Synthesis and DACS4:

After you have completed the connections described above, you are ready to power up Synthesis and DACS4. At this point, the Synthesis system and the laptop computer should be off. The EVP-1, which has no power switch, should already be on, as indicated by the red LED on the rear panel.

Turn the surround processor on first, allowing adequate time for all Synthesis components to come on.

1. *Turn the surround processor's gain control to minimum.*
2. *Turn on the laptop computer and wait for it to boot fully. When the boot is complete, there will be a message on the screen asking if there is an SDEC 1000/2500 in this system. The computer will pause at this point, waiting for your response. DO NOT respond at this time.*
3. *Select the AUX input on the surround processor. If you used a different input, select that one.*
4. *Slowly raise the gain of the surround processor, listening for any abnormal noises. This might be hum, pops, ticks, sizzling, hissing or any other sound, that is abnormal or unexpected. Remember that some low-level hum and hiss is normal, but it should be quite subtle. Continue raising the gain until you reach 0dB reference. If you hear nothing out of the ordinary, proceed to the next step. If you do hear something that you suspect may be indicative of a problem, turn the gain back down immediately and refer to the troubleshooting guide elsewhere in this manual.*

Preliminary Surround Processor Settings:

If this is the first time the system is being used, it is quite likely that the various user controls are still set to the factory defaults. However, it is a good idea to make certain they are. There are two ways to do this.

1. *Reset the surround processor. Instructions for doing this can be found in the surround processor operator's manual under "Restoring Defaults".*
2. *Check each setting manually. They should be set as follows:*

I. Global Settings:

A. Master Gain Control: 0dB

B. Speaker Configuration:

LEFT – CENTER – RIGHT, all models: Small, 80Hz high-pass

LEFT & RIGHT AMBIENTS, Synthesis 1: Small dipole, 80Hz high-pass

LEFT & RIGHT AMBIENTS, Synthesis 2 and 3: Small dipole, 100Hz high-pass

BASS SPLIT: 80Hz

REARS: None

SUBWOOFER: Yes, crossover set to 80Hz

C. All outputs levels set to 0.0dB

D. SUBWOOFER PEAK LIMITER: OFF

E. All surround processor EQUALIZATION settings should be as follows:

BASS: 0dB

TREBLE: 0dB

TILT: 0dB

LOUDNESS: OFF

F. LISTENER POSITION: 3'

II. Mode-Specific Settings:

A. Confirm the following settings for PRO-LOGIC mode:

AUTO AZIMUTH: OFF

DIALOGUE ENHANCE: 0dB

EFFECT LEVEL: 0dB

SUBWOOFER LEVEL: 0dB

SURROUND LEVEL: 0dB

B. Confirm the following setting for STEREO BYPASS mode:

SUBWOOFER LEVEL: 0dB

DACS4 Operation:

⚠ ***User Notes:***

We have made every effort to develop a software package that requires a minimum of acoustic measurement experience and is user friendly. For best results, you should possess a basic knowledge of the Windows™ 3.1x operating system and use of a pointing device (mouse or track-ball). Some knowledge of MS-DOS is also helpful, but not essential. If you do not have any experience with the Windows operating system, please review basic program conventions in the Windows User's Guide.

Notational Conventions:

This manual, and the online help topics found in DACS4, will use the following notational conventions:

1. *Keyboard references are noted in brackets. Here are some examples:*

   [Shift] = shift key

   [Ctrl] = control key

   [F1] – [F10] = special function keys

2. *When two or more keys are to be pressed simultaneously:*

   [Ctrl]+[T]

   [Ctrl]+[Alt]+[Tab]

- ***About Online Help***

  DACS4 has an extensive online help system. Topical information is continuously presented in a small window as you work. The full text of each topic typically exceeds the size of the window. You can scroll through each topic using the [PgUp] and [PgDn] keys. When you move on to the next step, the help field is automatically updated. Reading these help topics thoroughly while working will guide you through the entire calibration process.

  [F-1] Help

  If the information presented online proves inadequate, more in-depth information on all topics can be found by pressing [F1] any time during program execution. You cannot access the [F1] help topics when DACS4 is performing a test or computing Auto-EQ.

Starting DACS4:

When you boot the DACS4 computer, it automatically begins the DACS4 program. DACS4 runs in Windows 3.1x. Prior to starting the Windows operating system, program execution will pause, asking if there is an SDEC 1000/2500 in the system. Press [Y]es. Next, the computer will ask you to insert the blank disk provided with the SDEC into the drive slot "A". Do so now and press [ENTER]. At this time, the computer will load all necessary software on the disk to create a "LOADER" utility disk. Leave the disk in "Drive A" throughout the calibration session. For more information about the LOADER utility, refer to the "Maintenance" section of this manual.

- ***Initial DACS4 Screen***

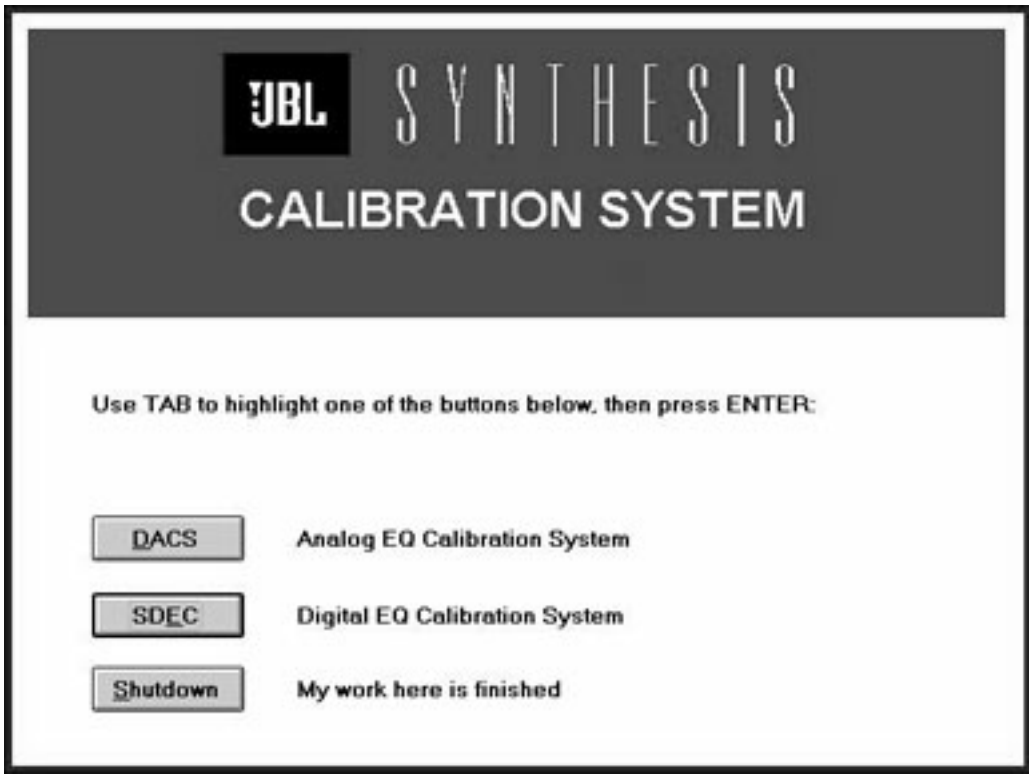


Figure 11:
DACS4 Opening Screen

This is the first and last screen displayed by the DACS4 System. You have three possible courses of action.

1. *Run DACS2. This is the previous release of DACS, which is still suitable for calibrating any Synthesis System that uses analog equalizers and crossovers.*
2. *Run DACS4.*
3. *Quit*

Highlight the [SDEC] button and double click.

- ***Enter Customer Information***

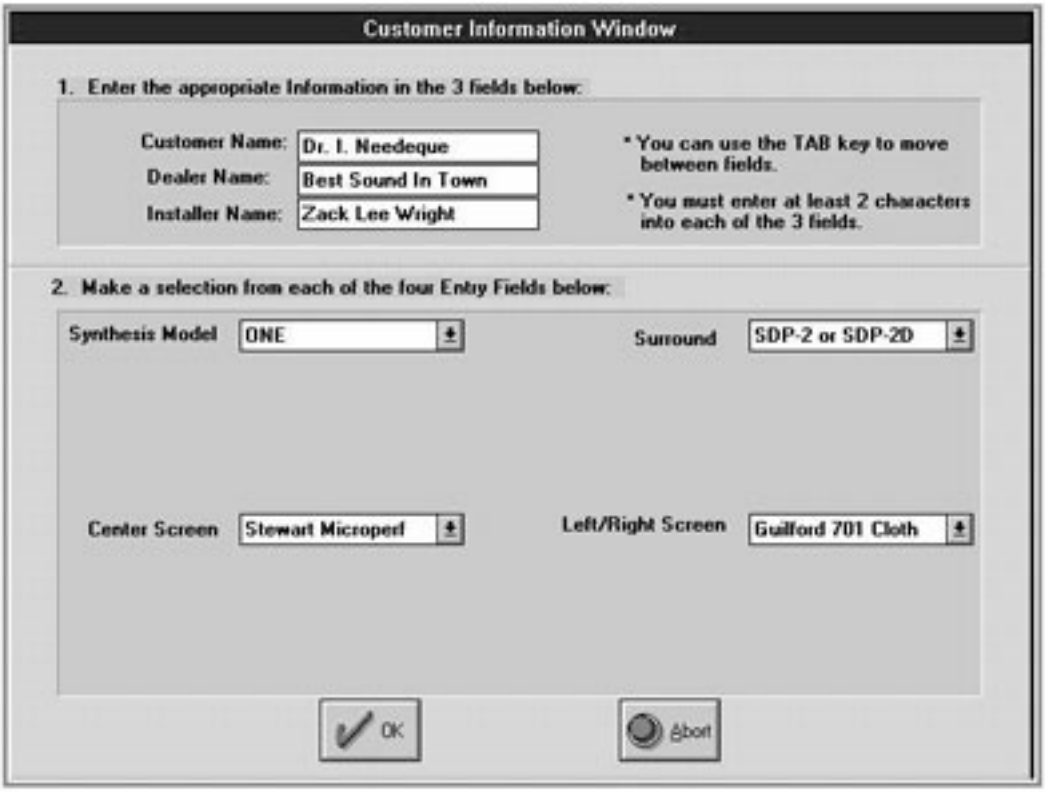

Customer Information Window
1. Enter the appropriate Information in the 3 fields below:
Customer Name:
Dr. I. Needeque
Dealer Name:
Best Sound In Town
Installer Name:
Zack Lee Wright
* You can use the TAB key to move between fields.
* You must enter at least 2 characters into each of the 3 fields.
2. Make a selection from each of the four Entry Fields below:
Synthesis Model
ONE
Surround
SDP-2 or SDP-2D
Center Screen
Stewart Microperf
Left/Right Screen
Guilford 701 Cloth
OK
Abort

Figure 12:
Customer Information Window

The information you provide here performs two important functions. It attaches a customer and dealer name to the test data that is saved by DACS4. This data is later used to create the Synthesis Calibration Certificate. Please take care to enter the customer's name exactly as he or she prefers. This is what will be printed on the certificate.

The information in section two is used to initialize the DACS4 program. Use care when selecting inputs. An incorrect entry may go completely unnoticed until it is realized that the system just doesn't sound right.

Use the [Tab] key to advance from one field to the next. If you wish to return to a previous field, press [Alt]+[Tab]. You must make an entry in all fields to run the program.

- ***Synthesis Model***

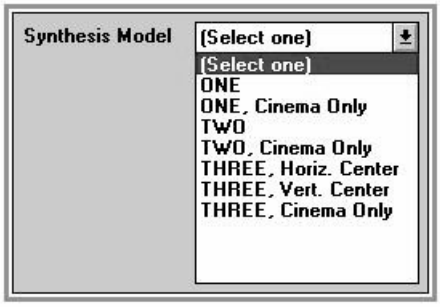


Figure 13:
Customer Information: Select a Synthesis Model

Click on the [⬇] button to expand the selection menu. Although there are only three Models of Synthesis, there are actually seven possible permutations currently available, each of which requires a different calibration strategy.

- ***Select a Surround Processor***

Figure 14:
Select a Surround Processor

Currently there is only one choice. Therefore, DACS4 will skip over this menu. In the future, when other surround processor models are added, you will need to select one from this list.

- ***Center Screen Compensation***

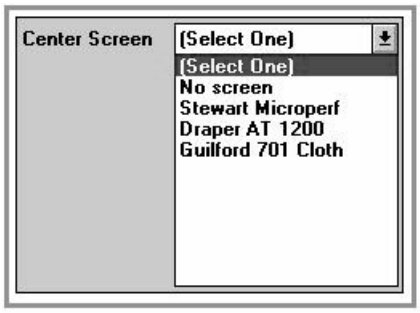


Figure 15:
Identify Screen Type, Center Channel

If the Center Channel speaker is behind a perforated screen or decorative cloth, you can add screen compensation to the SDEC. Select the appropriate screen: Cloth or None. If you are using a perforated screen or cloth not listed here, call your Synthesis Representative.

- ***Left/Right Screen Compensation***

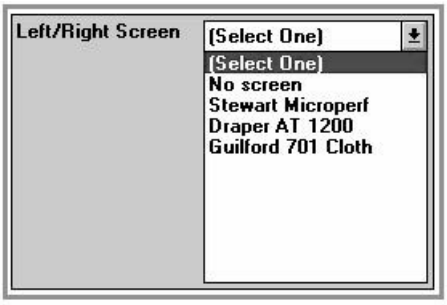


Figure 16:
Identify Screen Type, Left & Right Front

Similarly, select the appropriate entry for the Left and Right front speakers.

After you have entered the required information you may press [Enter] or click on [✔OK] button to advance to the next screen.

- ***Confirm DACS4 Connections***

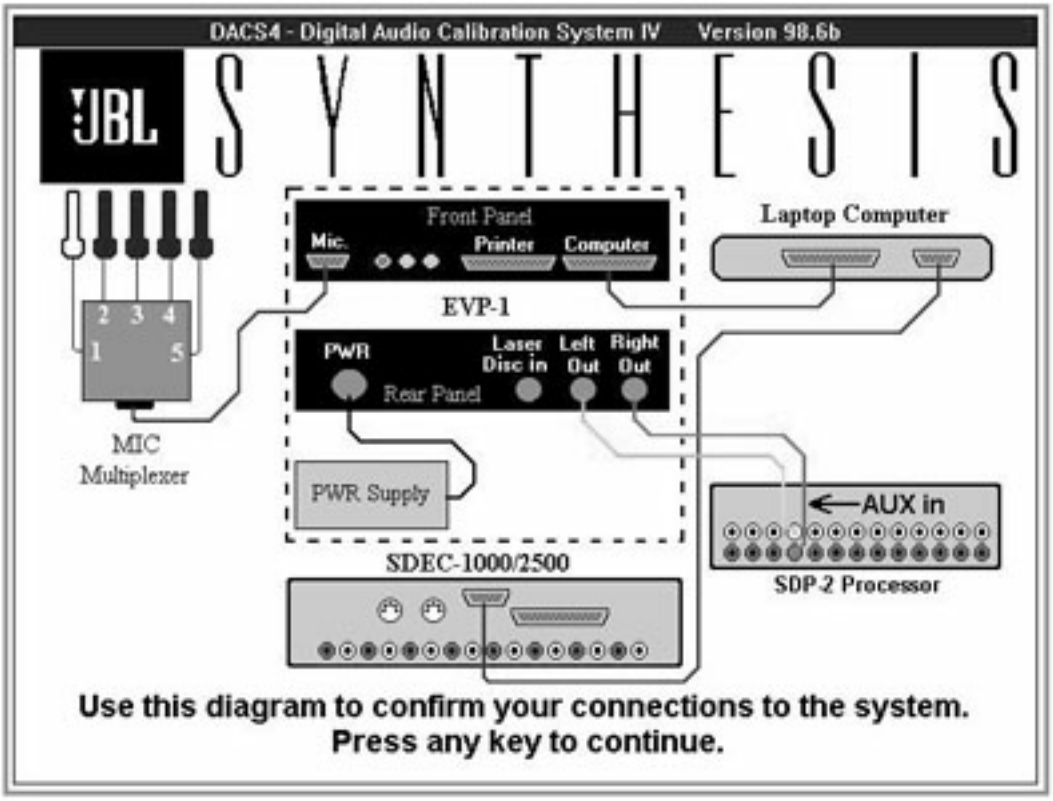


Figure 17:
DACS4 On-Screen Wiring Diagram

Before DACS4 runs, this simple hookup diagram is provided for your review. Please take a moment to confirm that these connections are correct. Press [Any Key] when you are ready to continue.

DACS4 Main Screen:

The following is an overview of the features and control facilities available on the main screen.

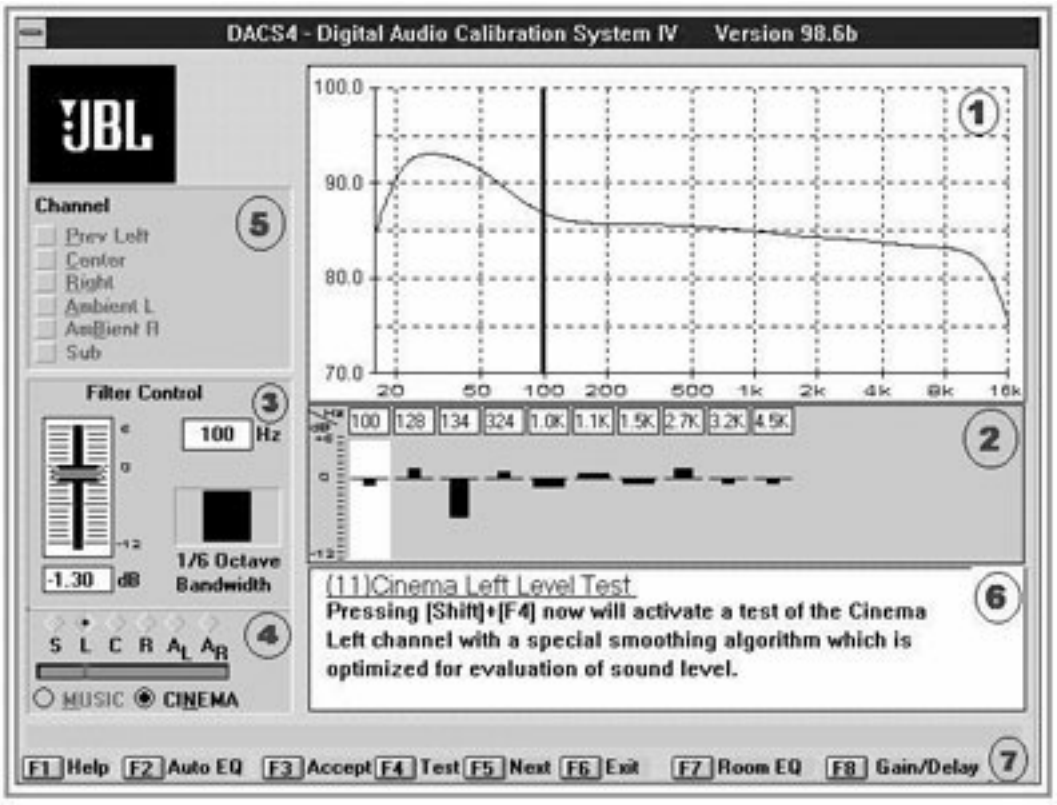


Figure 18:
DACS4 Main Calibration Screen

This is the main Synthesis calibration workspace. Before you begin calibration, take a few minutes to familiarize yourself with the eight different communication fields represented on this screen.

Response Graph:

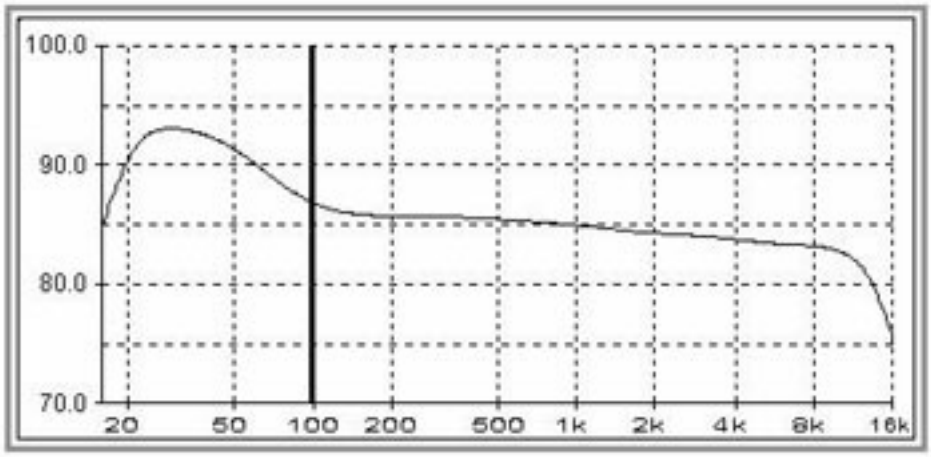


Figure 19:
Response Graph Window

This area of the screen will display the results of each test, overlaid on the target curve. Amplitude, in dB, is indicated vertically (Y-axis) and frequency, Hz, is indicated horizontally (X-axis). The heavy vertical line at 100Hz is the cursor location. It indicates the center frequency of the active filter. Numerous curves can be displayed simultaneously.

Filters at a Glance:

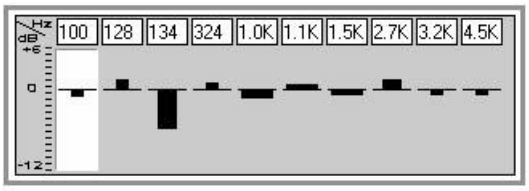


Figure 20:
Filter Setting and Control Field

The settings of all filters can be reviewed here. Each filter's center frequency is indicated in the small box above each bar graph. Each bar graph gives an indication of relative boost or cut. The width of each bar indicates the relative "Q", or bandwidth, of each filter. Finally, the highlighted filter is the currently "active" filter. Active, in this context, means the filter whose parameters can be adjusted. Only one filter can be active at a time.

Individual Filter Control:

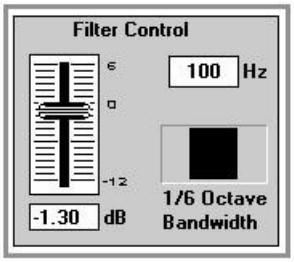


Figure 21:
Filter Control Field

The currently active filter's parameters can be precisely adjusted here. Any desired center frequency can be entered in the frequency box. Mouse clicking on the bandwidth bar will toggle through all available filter bandwidths. Click the mouse pointer over the slider on the left and you can raise or lower the gain of the filter. Alternately, you can enter any desired level of boost or cut (within the allowable range) directly in the dB box.

Channel and Mode Selection/Status:

Figure 22:
Direct Channel and Mode Access

The status of all channels is indicated here. Each channel is designated as follows: S = subwoofer; L, C, R = left, center and right; A_L , A_R = ambient left and right The currently active channel is indicated by a black dot in the diamond above each channel designator.

Any channels that have been completed are indicated as such by a black check mark in the diamond above each channel. The example in Figure 22 indicates that the subwoofers have already been calibrated.

You can jump directly to any channel and begin a test by clicking the mouse pointer on the diamond of the channel you want to test next.

The currently active mode (Music or Cinema) is indicated by the solid black text and a black dot to its left. Conversely, the inactive mode is shadowed.

Depending on the conditions under which you are testing, you may also switch between Music and Cinema modes by clicking the appropriate circle to the left of each mode.

Overlay Previously Tested Channels:

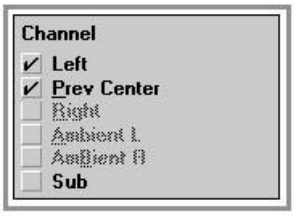


Figure 23:
Channel Display Control Field

When you perform a test on any channel, the corresponding text in this communication field turns solid black, indicating that it is available for display. To display a previously tested channel, click the mouse pointer on the box to the left of any available channel. A check mark will be placed in the box, indicating that this channel is being displayed. Available channels can also be displayed by pressing the letter key corresponding to the underlined letter in each available channel.

Online Help:

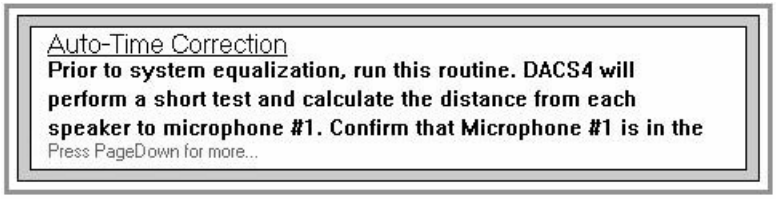

Auto-Time Correction
Prior to system equalization, run this routine. DACS4 will perform a short test and calculate the distance from each speaker to microphone #1. Confirm that Microphone #1 is in the
Press PageDown for more...

Figure 24:
Continuously Updated Online Help

Topical information is continuously presented here as you work. The full text of each topic typically exceeds the size of the window. To review the text in its entirety, use the [PgUp] and [PgDn] keys to scroll through the displayed topic. When you move on to the next step, this help field is automatically updated. Reading these help topics thoroughly while working will guide you through the entire calibration process.

Special Function Keys:

There are eight function keys used. Their function can be initiated by either pressing the function key itself, or clicking on them with the mouse pointer.

Figure 25:
Function Keys and Status Line

[F1] HELP This is a compilation of help topics, tips and tricks on nearly every aspect of DACS4 operation.

[F2] AUTO–EQ Initiates automatic equalization of the active channel

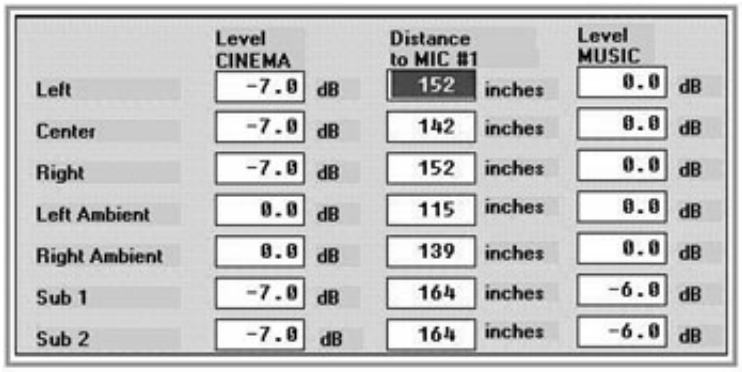
[F3] ACCEPT Press [F3] when you have completed all adjustments on the active channel. Pressing [F3] transmits the final settings to the SDEC, and puts a check mark in the channel status indicator.

[F4] TEST Runs a test of the currently active channel.

[F6] EXIT Program Quit.

[F7] Room EQ Inserts a special EQ instruction dialog in the online help window

[F8] GAIN/DELAY Pops up a dialog box that displays the current gain setting and the microphone-to-speaker distance for all channels.



	Level CINEMA		Distance to MIC #1		Level MUSIC	
Left	-7.0	dB	152	inches	0.0	dB
Center	-7.0	dB	142	inches	0.0	dB
Right	-7.0	dB	152	inches	0.0	dB
Left Ambient	0.0	dB	115	inches	0.0	dB
Right Ambient	0.0	dB	139	inches	0.0	dB
Sub 1	-7.0	dB	164	inches	-6.0	dB
Sub 2	-7.0	dB	164	inches	-6.0	dB

Figure 26:
Channel Gain and Delay Information

Calibration Walk-Through:

If you have read everything up to now, and done everything suggested, you should be looking at this screen on the DACS4 computer.

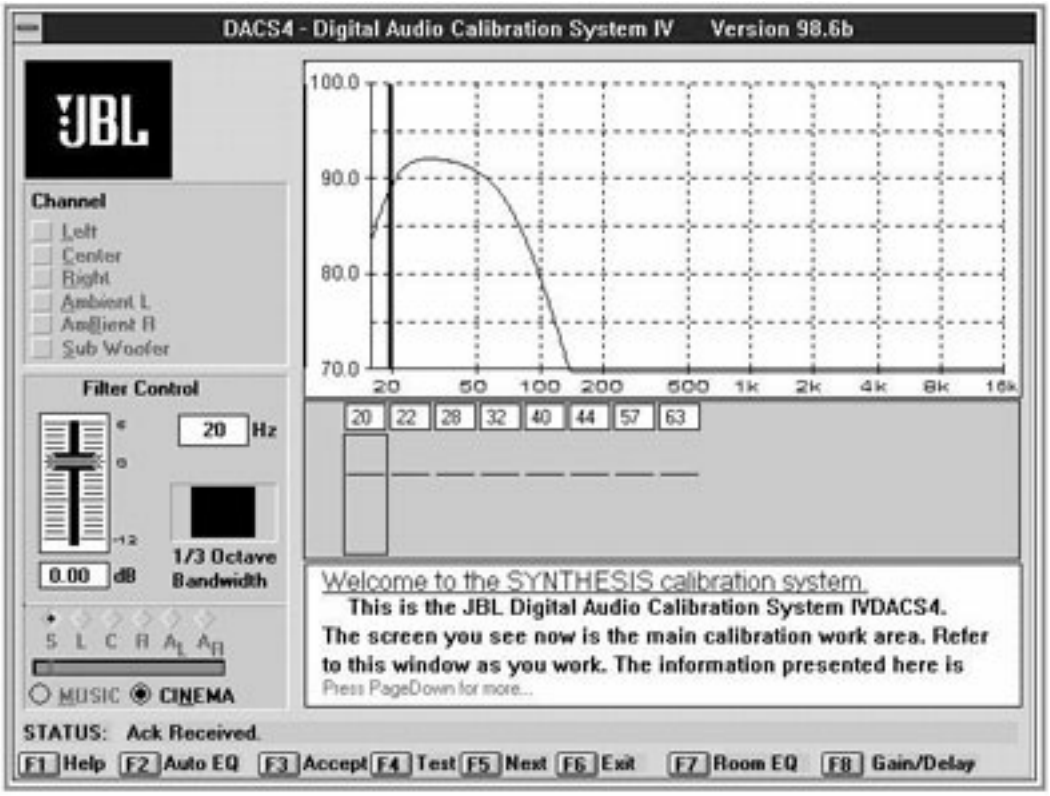

DACS4 - Digital Audio Calibration System IV Version 98.6b
JBL
Channel
Left
Center
Right
Ambient L
Ambient R
Sub Woofer
Filter Control
20 Hz
0.00 dB
1/3 Octave Bandwidth
S L C R AL AR
MUSIC CINEMA
100.0
90.0
80.0
70.0
20 50 100 200 500 1k 2k 4k 8k 16k
20 22 28 32 40 44 57 63
Welcome to the SYNTHESIS calibration system.
This is the JBL Digital Audio Calibration System IVDACS4.
The screen you see now is the main calibration work area. Refer to this window as you work. The information presented here is
Press PageDown for more...
STATUS: Ack Received.
F1 Help F2 Auto EQ F3 Accept F4 Test F5 Next F6 Exit F7 Room EQ F8 Gain/Delay

Figure 27:
Fresh Install, First Screen

Now would be a good time to begin reading the information presented in the online help field. It will guide you through the entire calibration process. When you have finished familiarizing yourself with this information, press the [Spacebar]. You will not be able to proceed until the [Spacebar] is pressed.

Auto-Time Correction:

The first test you will perform, Auto-Time Correction, will briefly stimulate each speaker to determine the distance from microphone #1 to each speaker. Press [Ctrl]+[T] to run the test. Immediately after the test a dialog box, which reports the measurement results, will appear.

	Level CINEMA		Distance to MIC #1		Level MUSIC	
Left	-7.0	dB	152	inches	0.0	dB
Center	-7.0	dB	142	inches	0.0	dB
Right	-7.0	dB	152	inches	0.0	dB
Left Ambient	0.0	dB	115	inches	0.0	dB
Right Ambient	0.0	dB	139	inches	0.0	dB
Sub 1	-7.0	dB	164	inches	-6.0	dB
Sub 2	-7.0	dB	164	inches	-6.0	dB

Figure 28:
Auto-Time Correction Dialog Box

Gain and distance information for all channels is displayed. Along the left, arranged vertically, is a list of channels. The left and right columns display the gain settings for each channel. The center column displays the results of the Auto-Time test.

In some circumstances, the measured distance may be incorrect. It is recommended that you take a moment to confirm that the measurements are correct. A normal tolerance for these measurements is +/– 6". Typically, if there is an error, it will be quite large, so it is easy to spot. As an example, If all of the speakers are about 200" from MIC #1, one channel might report 360" or 0".

If one or more channels are misreported, simply use a tape measure to determine the correct distance (from MIC #1 to the grille of the speaker) and manually enter the correct distance for that channel.

When this dialog box occurs, the left channel distance entry field is already highlighted. If this channel requires correction, you can type it in. If one of the other channels requires editing, press [TAB] key as often as necessary to advance to the desired channel. Or press the [TAB] key repeatedly until the correct entry field is highlighted. Now type in the correct distance.

When you are finished, press [F8] to clear this dialog box.

⚠ *The gain settings found here may or may not be needed at a later time. In any event, they are not to be changed from their current settings now.*

Cinema, Subwoofer Calibration:

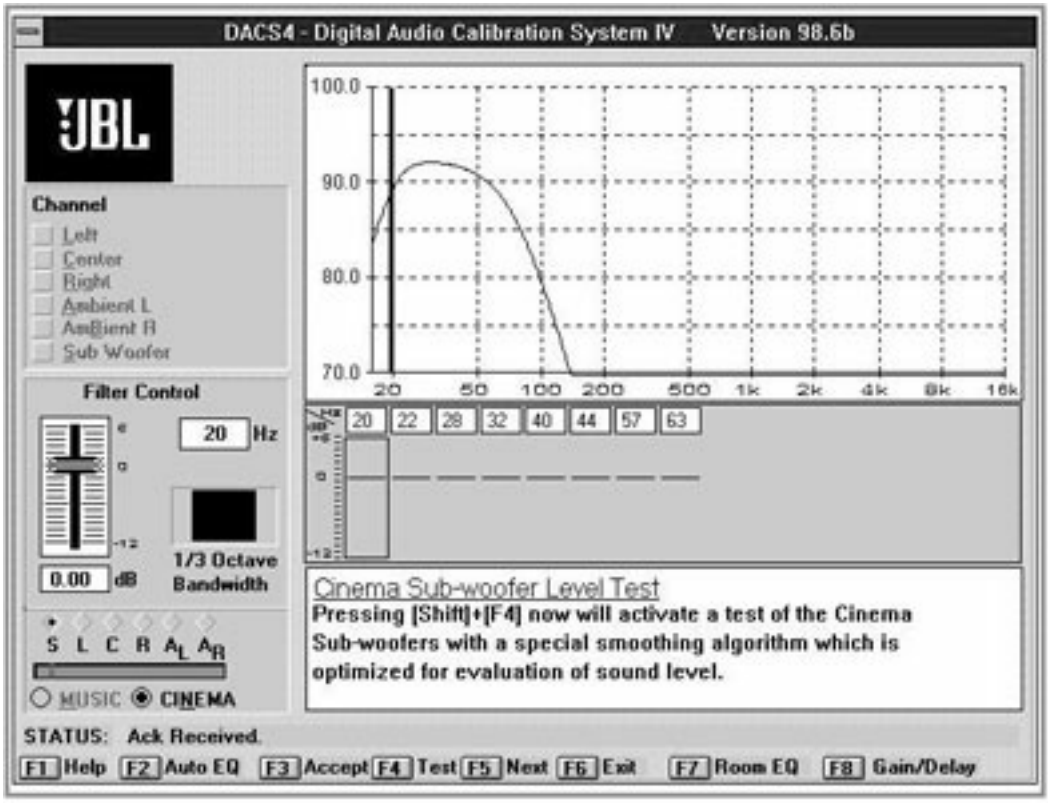

DACS4 - Digital Audio Calibration System IV Version 98.6b
JBL
Channel
Left
Center
Right
Ambient L
Ambient R
Sub Woofer
Filter Control
20 Hz
0.00 dB
1/3 Octave Bandwidth
S L C R AL AR
MUSIC CINEMA
100.0
90.0
80.0
70.0
20 50 100 200 500 1k 2k 4k 8k 16k
20 22 28 32 40 44 57 63
Cinema Sub-woofer Level Test
Pressing [Shift]+[F4] now will activate a test of the Cinema Sub-woofers with a special smoothing algorithm which is optimized for evaluation of sound level.
STATUS: Ack Received.
F1 Help F2 Auto EQ F3 Accept F4 Test F5 Next F6 Exit F7 Room EQ F8 Gain/Delay

Figure 29:
Ready for Sub-Woofer Level Test

Before attempting equalization of any speaker, it is necessary to have the level preset so the unequalized response plot fits as well as possible over the target curve. This is necessary for two reasons.

1. *The Industry-standard reference level is 85dBC when the source (DVD or LaserDisk) is at 0dB. Setting this test to fit the target will bring you very close to calibrated level.*
2. *The DACS4 equalizer has a gain range of +6 to –12dB. If any response peaks/dips are beyond that range, it will not be possible to correct.*

- ***Setting The Level***

The first test you run on each channel is totally uncalibrated. The sound level could be several dB high or low and the response may be very irregular. This extreme irregularity can make it quite difficult to determine how much the level needs to be shifted. DACS4 has a special display-smoothing algorithm designed to make it easy to determine the correct level. You invoke the smoothed display by pressing the [Shift]+[F4] keys. This will initiate a test and display the results with smoothing. Check that the surround processor's main level control is at 0dB. Press [Ctrl]+[F4] now.

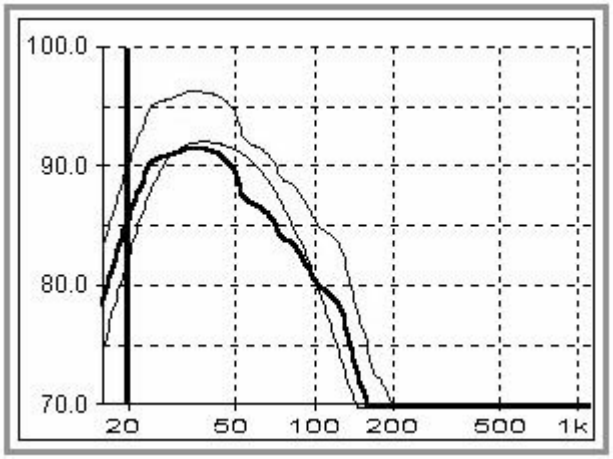


Figure 30:
Setting Level

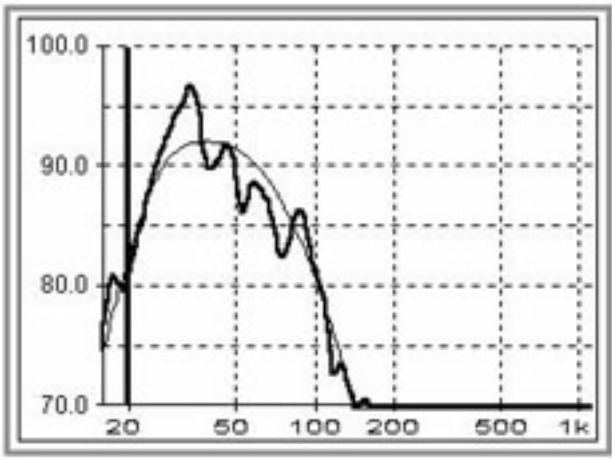


Figure 31:
Without Smoothing Filter

Figure 30 illustrates the results one might expect from using [Shift]+[F4] to set level. The fine upper trace is the first test, the lower trace is the second test with the subwoofer output lowered 5dB. Figure 31 illustrates the same test conducted using only [F4], which performs a standard resolution test. This subwoofer is now ready for equalization.

You may repeat the [Shift]+[F4] and/or [F4] as often as necessary to produce the desired result.

- ***Auto-Equalization***

When you have performed the tests and adjustments described above, you should have something similar to Figure 31 on the DACS4 response graph. You are ready to initiate the Auto-EQ routine. Press [F2] now.

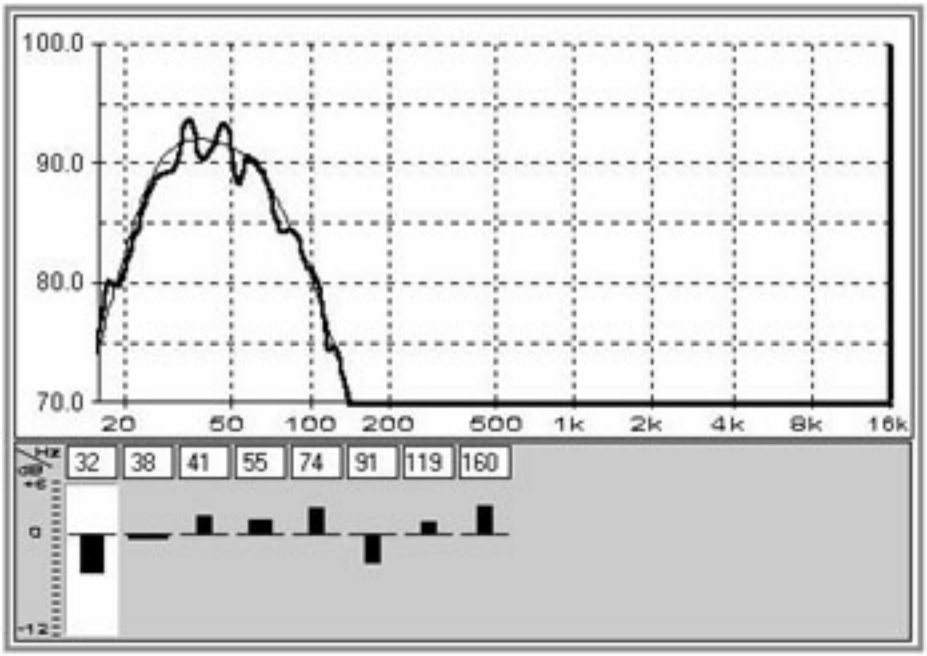


Figure 32:
Results of Auto-EQ

Figure 32 illustrates the results of Auto-EQ. Notice the remaining small peaks and dips at the top of the graph. With 10 bands of parametric equalization and some determination, these can be removed completely. Doing so dramatically increases the computation time needed. Additionally, small, high "Q" anomalies such as these have been found to be inaudible. Therefore, the Auto-EQ algorithm makes no attempt to correct them.

When you are satisfied with the performance of the subwoofers, press [F3]. [F3] transmits the final settings for this channel to the SDEC, places a check mark in the diamond above the subwoofer channel-status indicator and advances to the Left Cinema channel, ready for additional tests.

Cinema, Left – Center – Right Calibration:

The procedure in the steps above is substantially repeated for all subsequent channels. The topics that follow will focus on the differences. Steps that have already been explained will be listed only.

- ***Setting The Level***

  [Shift]+[F4]: Adjust level, repeat as needed.

  DACS4 performs no equalization at high frequencies. Therefore, when setting the level, focus your attention above 1kHz. The following table illustrates the relative importance of selected frequency ranges.

20–500Hz	500Hz–4kHz	4–8kHz	8–16kHz
N/A	+/– 3dB	+/– 1dB	+/– 3dB

Table 1:
Level Set Tolerance vs. Frequency

Table 1 demonstrates that it is most important to fit the test over the target as well as possible from 4 to 8kHz. The frequencies above and below are less critical but cannot be ignored. Every room exhibits different high frequency absorption characteristics, and every possibility cannot be anticipated in this document. Use your judgment when in difficult or unusual environments.

Some rules of thumb:

1. *The perception of "brightness" usually originates in the 4 to 8kHz region.*
2. *Significant variations (±3dB) above 8kHz are far less noticeable.*
3. *Low "Q" (wide bandwidth) response variations are much more audible than high "Q" variations. Always correct low "Q" errors first.*

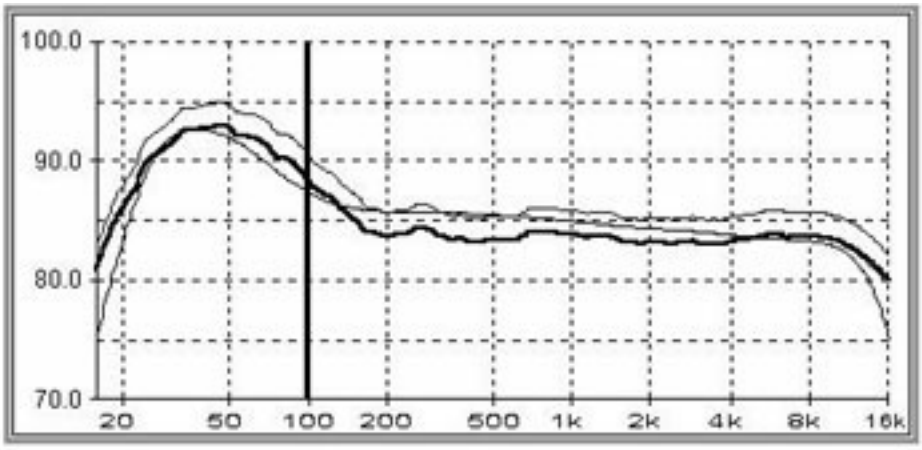


Figure 33:
Left Cinema Level Set

- ***Run Auto-EQ***

[F2]: Perform Auto-EQ.

DACS4 performs Auto-EQ only below 800Hz. Beyond correctly setting the level, no attempt is made to equalize above 800Hz. You may observe significant response variations above 800Hz. As explained earlier in this manual, this is a normal consequence of speakers interacting with the room. Attempts to EQ the high frequencies only degrades system performance.

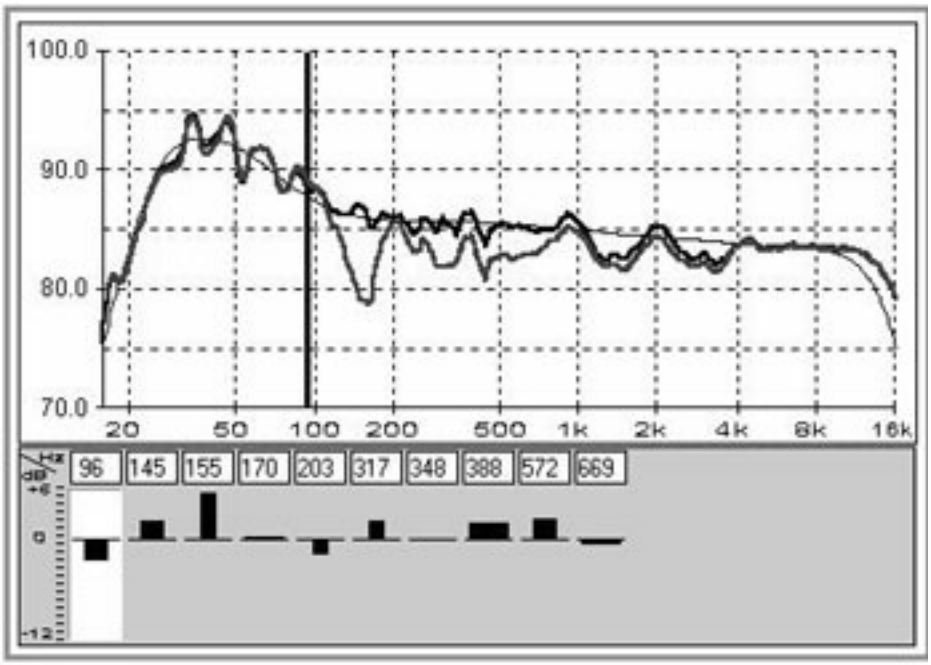


Figure 34:
Auto EQ

[F3]: Accepts settings.

Left and Right Ambient Calibration:

The calibration procedure for the ambient speakers is slightly different from the main speakers. This is because they are dipoles, designed to minimize direct radiation in favor of diffused reflections. Also, their location, at the sides of the room, has a very different effect on the ear/brain mechanism.

- ***Setting The Level***

The default display mode for the ambient speakers includes a one-octave smoothing filter. Therefore, it is not necessary to use [Ctrl]+[F4] to set the level.

[F4]: Set level. Repeat as needed.

The target curve is significantly different. Because of the very different nature of the speakers, the range of equalization is 100Hz to 5kHz. In addition, when setting the level, it is best to match the level over the entire range of the speaker.

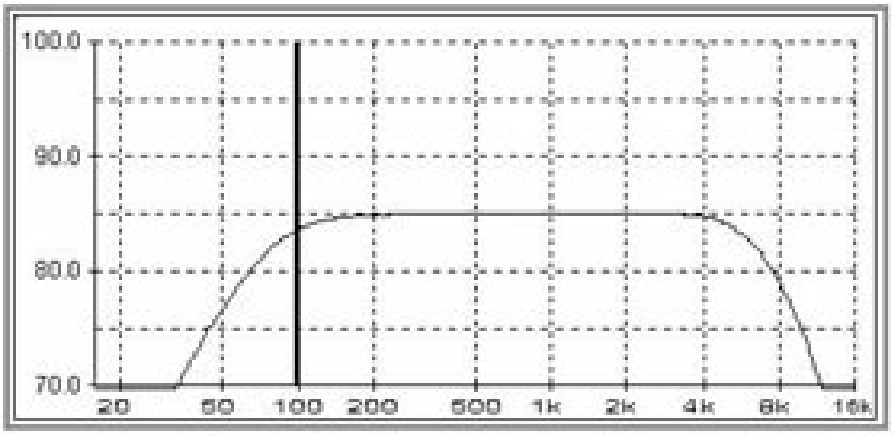


Figure 35:
Ambient Target

[F3]: Accept results.

If you are calibrating a Cinema only system, accepting the last channel signals the end of the calibration sequence. Skip forward to the topic "Quitting DACS4" on page 54.

If you are calibrating a Cinema + Music system, read on.

Music Mode Calibration:

As soon as you accept the last channel in Cinema mode, DACS4 automatically reconfigures itself for calibration of the Music mode speakers. Follow the instructions presented on the DACS4 screen during this transition.

There is no need to calibrate the center channel or the ambient speakers. They were calibrated previously.

You will calibrate the subwoofers and the left and right front speakers. The targets are different, but the procedures are the same.

Quitting DACS4:

- ***After a Complete Calibration***

When you have accepted the last channel, DACS4 will automatically transmit all settings to the SDEC and those settings will be burned to the nonvolatile FLASH memory.

[F6]: Quits DACS4

Follow the instructions on the DACS4 screen to quit the program. Remove the "Loader" utility disk from the DACS4 computer and store it in a safe location at the installation site. All the usual admonitions about dust, heat and humidity apply to the choice of storage location.

- ***Quitting When Some Channels Are Not Accepted***

If you must terminate a session before you have completed calibration, press [F6]. You will be warned that quitting before completion of the job will lose any settings you may have completed at this time. You will be given an opportunity to reverse your decision to quit. If you click [Cancel], you will be returned to the program. If you click [OK], all settings will be discarded and the program will be terminated.

SDEC Maintenance:

- ***Using The Loader Utility***

When you began the SDEC calibration process, DACS4 asked you to install the 3.5" floppy disk provided with the SDEC. After calibration is complete, this disk will contain a file that contains all settings made to the SDEC during calibration. Leave this disk at the installation site, using conventional precautions about dust, heat and humidity.

In the event the SDEC needs to be replaced, you will use this disk to load the calibration settings into the replacement SDEC. To do this you will need a portable computer running Windows 3.xx or Windows 95. It must have an available COM port and a high-density disk drive. Use the following procedure to load the settings.

1. *With everything off, connect a standard DB9 (9-pin) cable between the computer's COM port and the connector located on the rear panel of the SDEC.*
2. *Turn on the SDEC.*
3. *Boot the computer to Windows.*
4. *Insert the disk.*
5. *Click on File, Run.*
6. *Type A:loader.*
7. *Press [Enter].*
8. *Wait patiently. When the settings have been successfully transmitted and burned into the SDEC memory, a "DONE" dialog box will pop-up.*
9. *Turn everything off, remove the disk and return it to storage. Install the new SDEC.*

Troubleshooting:

- ***Correcting Hum Problems***

Reading this will help you avoid hum problems in any Synthesis Home Theater System installation. It really isn't very difficult to do, but you will need to take some preventive measures during system installation to prevent it.

Why Does It Hum In The First Place?

Anytime you interconnect two analog audio signal devices, and they each have their own AC cord, you can potentially generate some hum. When you interconnect several devices, as is the case in a Synthesis system, the potential is many times greater.

All audio signal devices must reference their internal circuitry to "ground" in order to establish a zero voltage "reference" point for all active circuitry. In reality, it is not necessary for any isolated piece of equipment to be connected to "earth ground". An airplane is a good example of such a situation. The need to connect home equipment to earth ground is based on safety concerns. It is essential that a path to earth ground be provided, as a drain of unwanted potential. An example of this would be a lightening strike or an insulation failure within a piece of equipment. Since the system must be earth grounded to maintain safety (and in many states, to be legal), this is the logical place to begin.

When two or more audio devices are interconnected, they must have precisely the same zero voltage reference point or you may encounter problems. When you hear hum, this is an indication that one or more of the devices in the audio chain has a slightly different ground reference potential. This is what we must correct to eliminate audible system hum. There are many "bad science" solutions out there. Please resist the temptation to experiment with them, ultimately, they will not be fully effective, in some instances equipment can be damaged, they may actually be illegal and in many cases are downright dangerous.

What You Can Do During Installation

First, do not isolate the third wire ground at the AC plugs. This is essential for safety as well as proper hum reduction. Make certain this connection is as good as possible. The goal is zero resistance to the ground outlet. Theoretically, this should be enough to prevent hum problems, but it isn't always. Occasionally, the house wiring does not provide a low enough resistance between components to be totally effective. Particularly when more than one AC outlet is used. High resistance house wiring can be caused by oxidized or loose wiring connections, or even improperly wired outlets. Correcting the house wiring may not be an option, and even then you may encounter difficulty. You do not need to correct the house wiring to get the desired results.

It may be necessary to tie all of the hardware together electrically so there is no ground potential difference between the various devices and third wire ground from the AC outlet(s). Even a few microvolts difference will be audible. This is why you must create the lowest possible impedance ground path between all of the equipment. Zero impedance = zero volts.

One very effective way of accomplishing this is by mounting the devices into a metal equipment rack. Most equipment racks and the hardware you are installing are painted or anodized. These finishes will prevent a good ground. When installing the equipment, file or sand the rack and the panel where they will contact each other until you have a clean, metal to metal contact. Alternatively, you can put an unused external shakeproof lock washer (sometimes called a star washer) between the rack and the panel with each mounting screw. This will cut through the finish as you tighten the hardware.

If the SDP-2 surround processor is not being mounted directly to this rack you may need to fabricate a ground strap using 16 or heavier gage stranded wire with crimp-on ring lugs on the ends. Securely attach one end of the ground strap to the SDP-2 using the center top cover retaining screw (found on the rear) as an attachment point. Attach the other end of the ground strap to the metal equipment rack, in a central location, close to the other devices in the rack. Make certain the finish on the rack is not insulating the connection.

If mounting the devices in a metal equipment rack is not an option, you may need to fabricate ground straps and tie some or all of the devices together. Use 16 gage or heavier stranded wire, with crimp-on ring lugs at each end of the wires. In this instance you will want to create a "star" grounding pattern. This means that each device will have a ground wire attached directly to the same screw on the SDP-2 surround processor chassis. The center top cover retaining screw on the back of the SDP-2 can be used for this purpose.

In some difficult installations, you may find it necessary to use a combination of both techniques described above. Whatever the details of the particular installation, you must reduce all ground path resistance to as close to 0W as possible. This is the correct method of eliminating hum. Do not try to "break" the ground by defeating the ground connection on the AC plug. Although this sometimes appears to improve the audible hum, you are actually creating a potential for much more serious problems associated with floating grounds. Pops and clicks can be one result. More serious, changes in the AC (from large appliances or peak power usage for example) can cause the hum to return intermittently after you have left. This can be a real service headache.

Video Devices

Video devices represent a special challenge. This is because they are frequently connected to externally grounded sources, like cable TV service. Projectors are never installed close to the other equipment, so they are almost always plugged into a different AC circuit. This is a number 1 cause of ground current related problems. In the case of cable TV service, one solution is to strap the incoming cable shield directly to the AC receptacle ground. Another, perhaps easier approach is to install an isolation transformer.

If the source of hum is the remote AC connection of the projector, the best solution is to pull a 12-gage ground wire along with the video cables. Connect this ground wire between the chassis of the projector and the SDP-2.

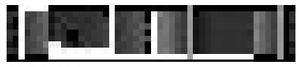
SPECIFICATIONS 5.0

	SDEC-1000	SDEC-2500
THD + Noise	0.02% @ 1kHz	0.02% @ 1kHz
Frequency Response	<15hz –20kHz +0,–1db	<15hz –20kHz +0,–1db
S/N Ratio (A-weighted)	100db ref: max output	100db ref: max output
Dynamic Range	114dB	114dB
Input Level Range	15µV – 8V	15µV – 8V
Input Impedance	10k ohms	10k ohms
Output Impedance	50 ohms	50 ohms
Crossover	4th order Linkwitz-Reilly	N/A
Filter Characteristics		
Attenuation Range	+6db, –12dB	+6db, –12dB
Center Frequency Range	20Hz – 20kHz	20Hz – 20kHz
Bandwidth	0.1 – 5 octaves	0.1 – 5 octaves
Total Bands Provided	90	90
Unit Size	3.5"H x 19"W x 18"D	3.5"H x 19"W x 18"D
Unit Weight	22 lbs.	22 lbs.
Power Required	40 watts, max.	40 watts, max.
All features and specifications are subject to change without notice.		

SYNTHESIS ONE Interconnection Diagram

SDP-2D

SDP-RFD

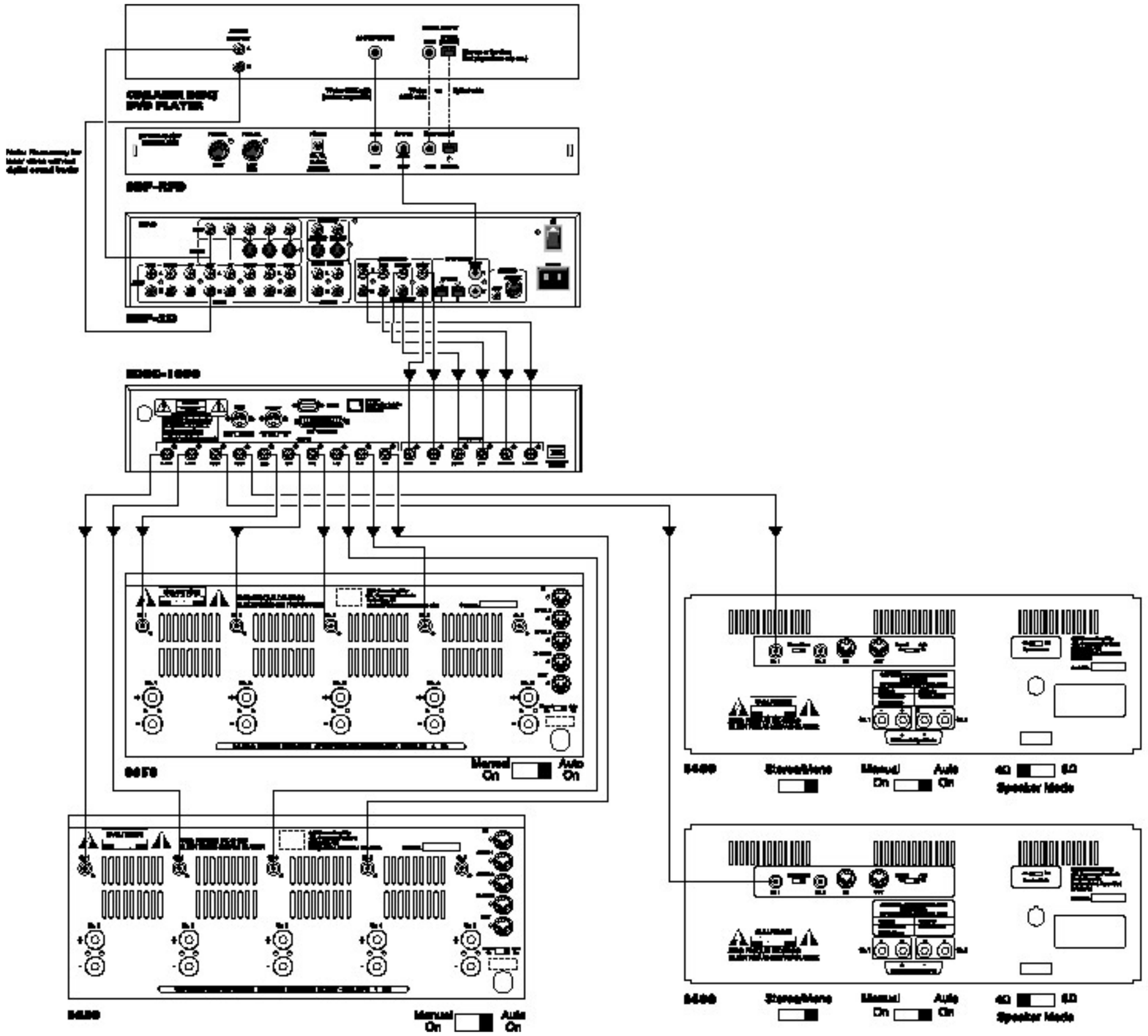

SDEC-1000

S400

S400

S650

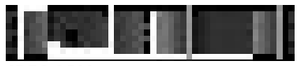
S650



SYNTHESIS TWO/THREE Interconnection Diagram

SDP-2D

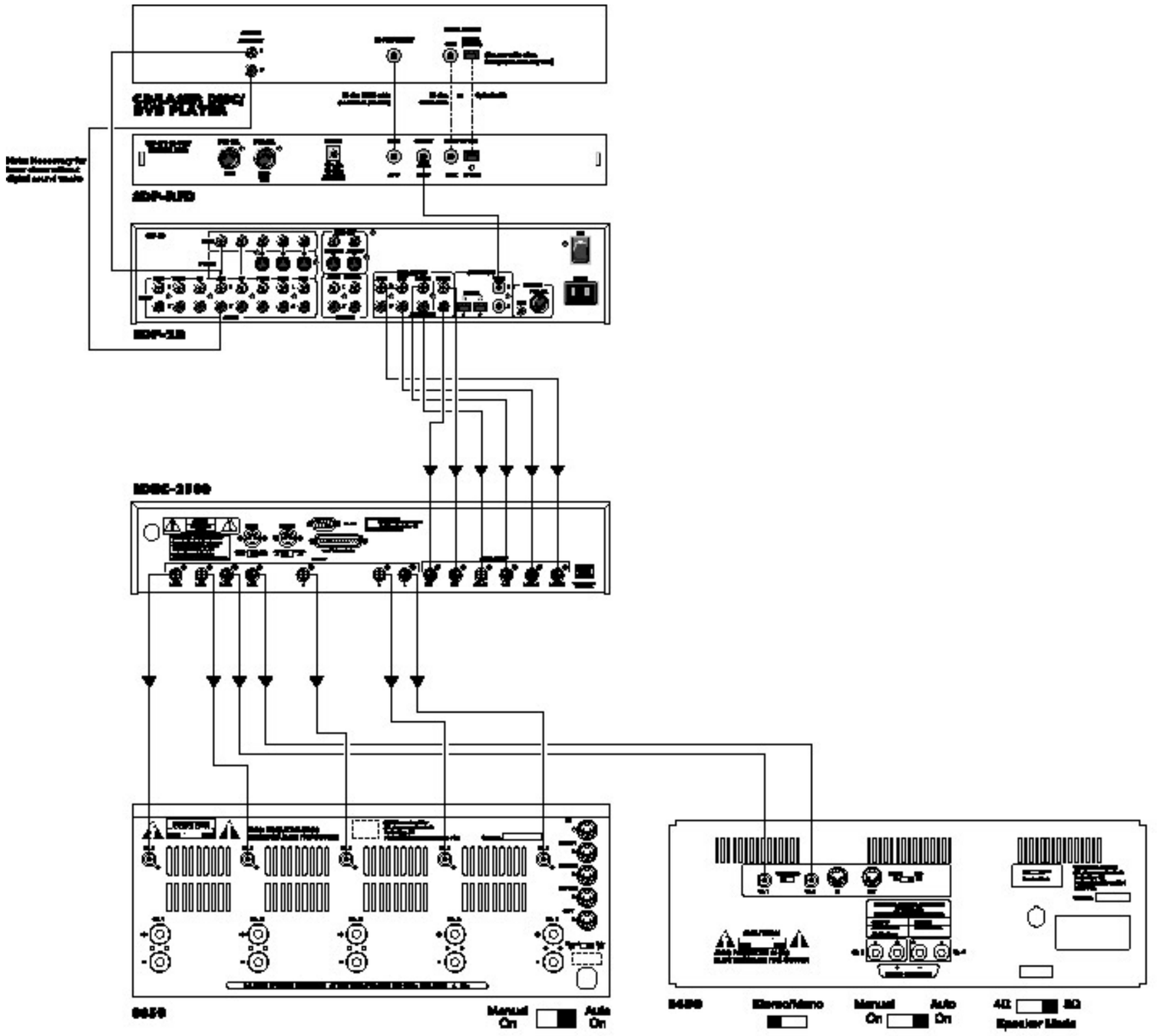
SDP-RFD



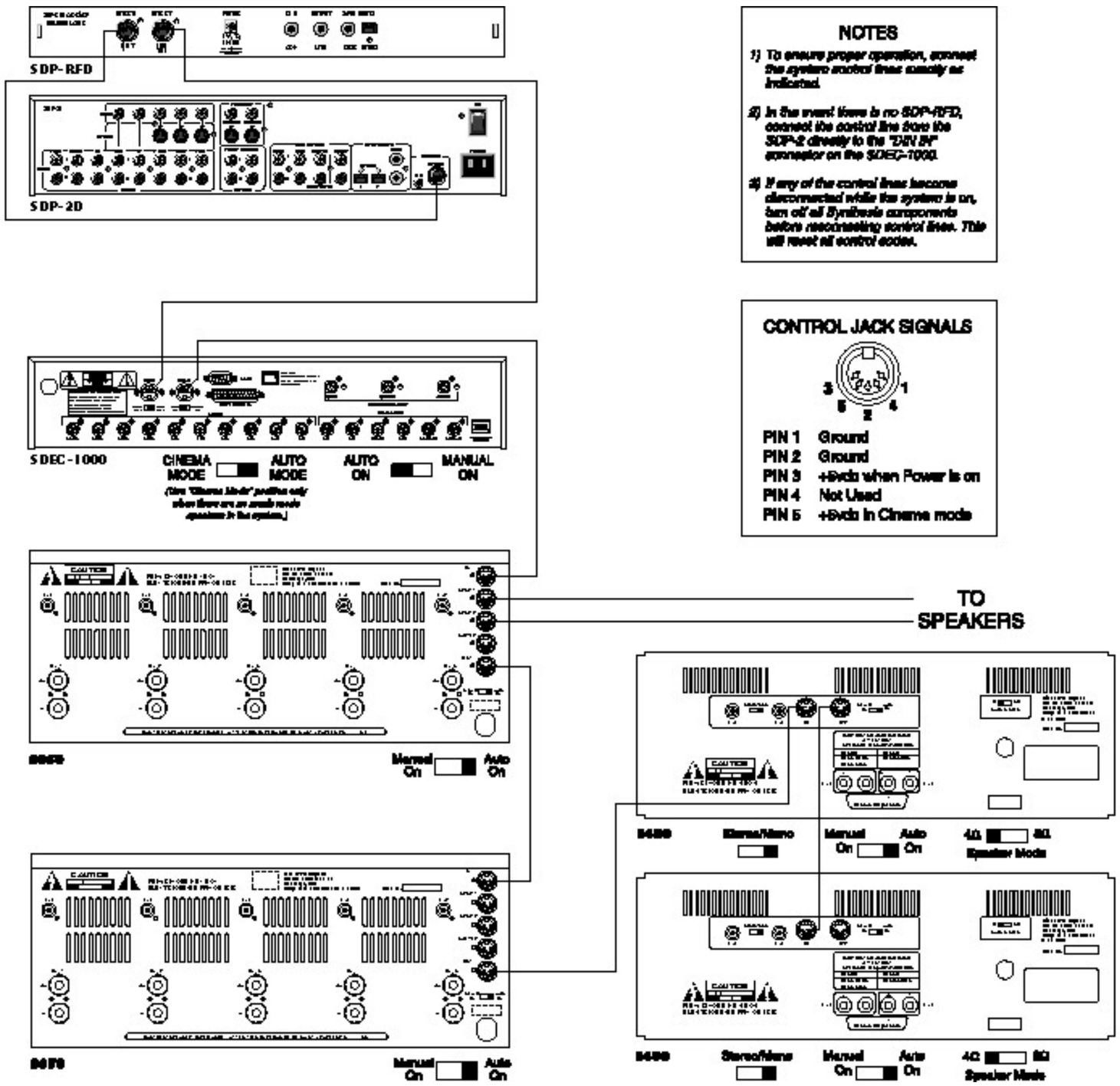
SDEC-2500

S400

S650



SYNTHESIS ONE Control Wiring Diagram



NOTES

1) To ensure proper operation, connect the system control lines exactly as indicated.

2) In the event there is no SDP-RFD, connect the control line from the SDP-2 directly to the "DEN IN" connector on the SDEC-1000.

3) If any of the control lines become disconnected while the system is on, turn off all Synthesis components before reconnecting control lines. This will reset all control modes.

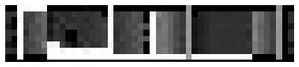
CONTROL JACK SIGNALS

PIN 1	Ground
PIN 2	Ground
PIN 3	+6vdc when Power is on
PIN 4	Not Used
PIN 5	+6vdc in Cinema mode

SYNTHESIS TWO/THREE Control Wiring Diagram

SDP-2D

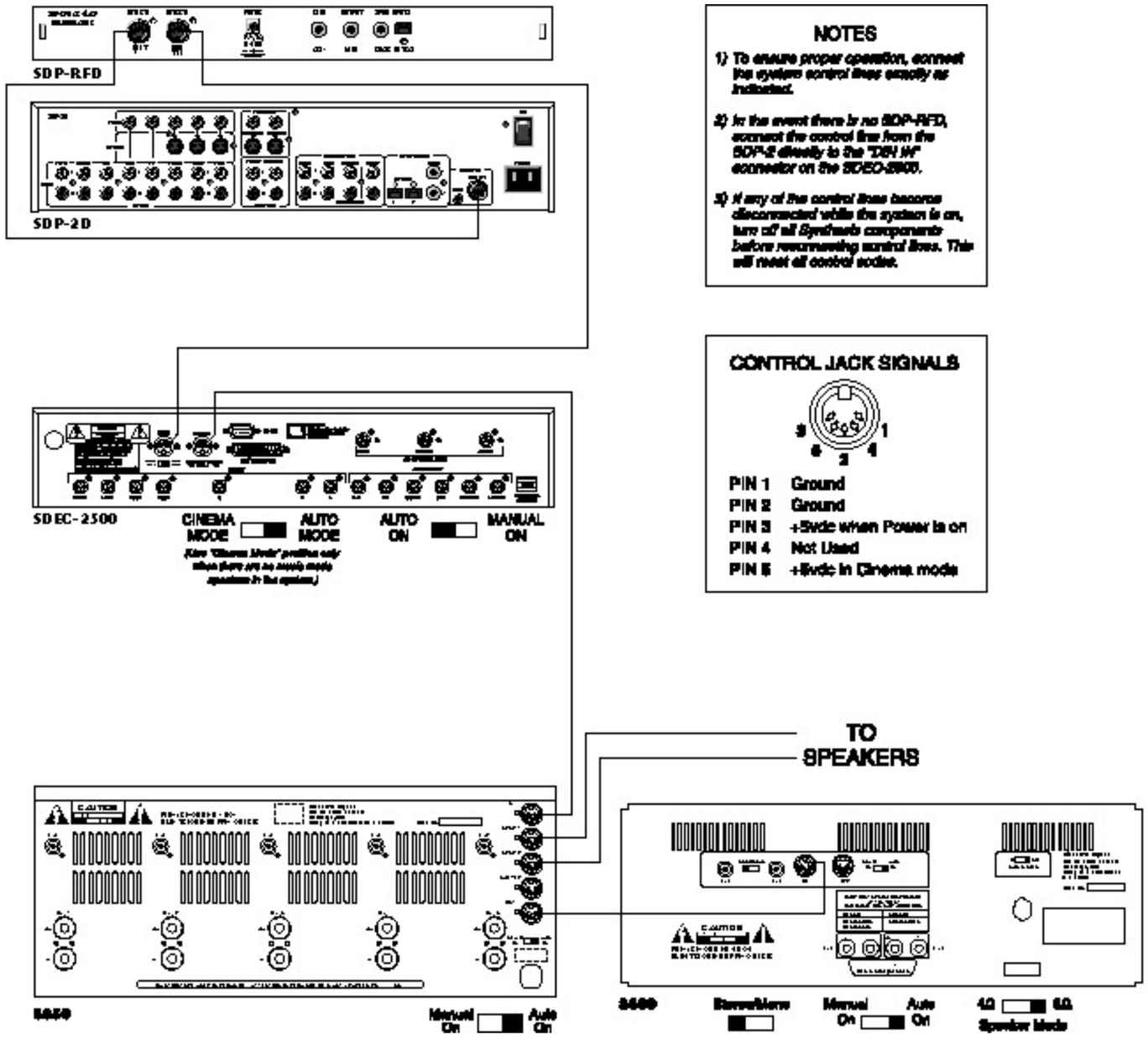
SDP-RFD



SDEC-2500

S400

S650



NOTES

1) To ensure proper operation, connect the system control lines exactly as indicated.

2) In the event there is no SDP-RFD, connect the control line from the SDP-2 directly to the "DIN IN" connector on the SDEC-2500.

3) If any of the control lines become disconnected while the system is on, turn off all Synthesis components before reconnecting control lines. This will reset all control modes.

CONTROL JACK SIGNALS

PIN 1	Ground
PIN 2	Ground
PIN 3	+5vdc when Power is on
PIN 4	Not Used
PIN 5	+5vdc in Cinema mode